

## Getting Started Guide

Thank you for your recent purchase of the Texas Instruments™ RFID Systems' *Series 6400 Access Control Evaluation Kit*. This Kit enables integrators to rapidly incorporate our proven 13.56 MHz contact-less technology into existing security applications, as well as design it into new applications.

We're pleased to serve the "Access Control" market with a RFID product that boasts read/program capability through RS-485 serial data communications, while still offering backwards compatibility with the widely adopted Wiegand protocol standard. The added value of higher security UID-based data encryption ensures card uniqueness, and makes card copying using conventional methods virtually impossible.

This *Getting Started Guide* provides simple step-by-step instructions to get the user up and running quickly. More detailed information including hardware and protocol descriptions can be found both on the included software CD and on the TI-RFid™ website @ [www.ti-rfid.com](http://www.ti-rfid.com)

**Preliminary**

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## 1. General

Texas Instruments' Series 6400 Evaluation Kit is designed to help the user explore the advanced capabilities of the 6400 Series Access Control Reader family in conjunction with TI-RFid's ISO/IEC 15693 compliant badges.

The Series 6400 readers are ISO/IEC 15693 compliant, and are therefore compatible with Tag-it™ HF-I badges, as well as other ISO/IEC 15693 compliant tags and cards.



**S6400 Reader Family**

Information stored on an ISO/IEC 15693 compliant badge is organized into 64 blocks, each containing 4 bytes of data. (1 byte = 1 ASCII character.) Blocks can be programmed, re-programmed, viewed, and locked to prevent reprogramming.

The following are just a few of the RFID operations (and their ISO/IEC 15693 equivalent commands) that can be performed on cards and tags with this kit:

- **Identify (Inventory) All Cards** in field.
- **View (Read) One Block** of data on card.
- **View Many (Read Multiple) Blocks** of data at once.
- **Program (Write) One Block** of data on card.
- **Program Many (Write Multiple) Blocks** of data at once.
- **Lock One Block** of data.
- **Lock Many (Lock Multiple) Blocks** of data.

## 2. Evaluation Kit Contents

The evaluation kit includes the following components:



**S6400 Series Evaluation Kit**

| Item | Qty. | Description  |
|------|------|--|
| 1    | 1    | S6410 Wall Plate Reader                                  |
| 2    | 1    | S6420 Mullion Reader                                     |
| 3    | 1    | Universal Power Supply with Global Adapters              |
| 4    | 1    | Harness with RS-485/RS-232 Converter                     |
| 5    | 1    | Harness with Wire Leads                                  |
| 6    | 1    | Serial Data RS-232 Cable                                 |
| 7    | 2    | Mounting Hardware Packs                                  |
| 8    | 5    | ISO 15693 Compliant Programmable Badges (Pre-programmed) |
| 9    | 1    | Software Demo CD   |
| 10   | 1    | Getting Started Guide (This Guide)                       |
| 11   | 1    | Installation Guide                                       |
| 12   | 1    | Carrying Case  |

If any of the listed items are missing from this kit, please contact technical support.

### 3. Setup & Test - Self-Run Mode

The S6400 readers are shipped in the factory-default “Self-Run” (Wiegand data output) mode, allowing them to operate independently of a computer or security control panel. Follow the instructions below to activate the readers in this mode and verify their functionality.

1. Connect the harness with the RS-485 converter to one reader. *The RS-485 converter is not needed for this test, however the harness includes a receptacle for the power supply, which is required.*



**Note:**

*Be sure that the remaining unconnected wires do not touch each other, as this may cause operation in “Self Run” mode to fail.*

2. Connect the power supply to the power connector on the RS-485 converter harness.



**Caution:**

*The connector on the power supply must be set at positive tip or interior output voltage. Be sure the arrow on the tip of the power supply is lined up with the (-) setting on the power supply output barrel indicating negative barrel (positive tip) voltage.*

3. Plug the power supply into an AC power source using the appropriate adapter supplied.
4. Test reader by slowly bringing one of the pre-programmed ISO/IEC 15693 compliant badges within close range of the reader. As soon as the badge is within the reader’s range, the reader will beep and the LED will flash once to indicate a successful read has taken place.



## 4. Connecting to a Wiegand Security Panel

The S6400 readers are designed to work with any security controller which follows the Wiegand protocol standard. All readers are placed in Self-Run (Wiegand data output) mode upon shipment, thus they are “ready out of the box” for connection to a Wiegand security panel. A harness with tinned wire leads is included to simplify connection to a Wiegand security panel.

Follow the security panel manufacturer’s instructions to connect the reader to the panel, using the following wiring guide as a reference. The essential connections are necessary for proper operation and data transfer in Self-Run mode. For more information regarding the optional connections, refer to the S6400 User’s Guide (11-06-21-711).

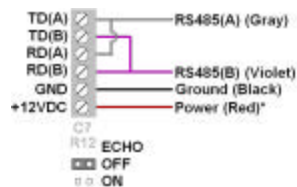
| Essential Connections |                  |
|-----------------------|------------------|
| Red                   | Power (9-14 VDC) |
| Black                 | Ground           |
| Green                 | Wiegand Data(0)  |
| White                 | Wiegand Data(1)  |

| Optional Connections |           |
|----------------------|-----------|
| Blue                 | Hold      |
| Orange               | Green LED |
| Brown                | Red LED   |
| Yellow               | Audio     |

## 5. Connecting a Single Reader to a Computer

Programming and locking data on a badge requires two-way communication, which can be achieved by operating the reader in host-driven mode. The included RS-485/RS-232 converter and host software allow the reader to operate in this mode using a PC as the host.

1. Follow the setup procedure in section 3 to verify reader functionality.
2. Verify proper connection of the RS-485/RS-232 converter to the reader using the following diagram as a reference.



**Note:**

Observe the proper orientation of the jumper on the RS-485/RS-232 Converter - it must be set to “echo off”.

3. Connect the RS-485 Converter to the computer’s serial port using the serial cable provided.

## 6. Software Installation

The S6400 Series software application demonstrates the readers' features that are available through the RS-485/RS-232 serial link.

At minimum, the software requires the following:

- 3.5 MB available hard disk space
- Windows 98 SE or later

The software can be installed from the included CD:

**D:\software\setup.exe**

(where "D" is the assumed drive letter of the active CD-ROM drive.)

Double-click "setup.exe" to begin the installation.  
Follow the prompts to complete the installation.

The software can also be downloaded directly from the website:

<http://www.ti.com/tiris/docs/products/tools.shtml>

Download "S6400 Utility Software.zip"

Un-zip the files and double-click "setup.exe" to install.

Upon installation, double-click on the **S6400 Utility Software** icon to run the software.

## 7. Software Functionality Test (One Reader)

1. Follow the setup procedure in section 5 and the software installation procedure in section 6.
2. Run the software by double-clicking the **S6400 Utility Software** icon.
3. From the Communications Menu, select the COM port to which the reader is connected. The default port is COM1.
4. Select the desired baud rate from the Communications Menu. The default baud rate is 38400.
5. Press the Setup button to view reader's current state.
6. Press the Version button to view the reader's serial number and firmware version.



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**Note:**

*Firmware version 2.0 was in effect as of the printing of this guide. If the version displayed is higher than version 2.0, it is recommended to check for a newer version of this guide, as new features may have been added. The most recent versions can be downloaded from the document center @ [www.ti-rfid.com](http://www.ti-rfid.com).*

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## 8. Basic ISO/IEC 15693 Software Commands

The host software allows data to be viewed and programmed in hexadecimal format. Executing the following commands in order will help you familiarize yourself with the software interface. Sample output can be seen in the graphic on the following page.



**Note:**

*Be sure the "ISO/IEC 15693" tab (under the "Go" button) is selected. For information regarding the ISO/IEC 14443 tab, consult the User's Guide.*

**Identify All Cards** in field:

1. Place one or more badges in the read field.
2. Select "Identify All Cards" to display the UID number of each badge in the field.
3. Click "Go".

**View One Block** of data on card:

1. Place a badge in the read field.
2. Select "View One Block" and enter the desired block number in the block number field.
3. Click "Go".

**Program One Block** of data on card:

1. Place a badge in the read field.
2. Select "Program One Block"
3. Enter the desired block number and the data to be entered in the appropriate fields.
4. Click "Go".
5. Repeat the "View One Block" process to verify that data has been written.



**Note:**

*The badges included with this kit have encrypted data pre-programmed into blocks 0-4, which demonstrates the customizable functionality of the Wiegand card data output mode. To avoid destroying this data, do not reprogram blocks 0-4.*

**View Many Blocks** of data at once:

1. Place a badge in the read field.
2. Select "View Many Blocks"
3. Enter the desired number of consecutive blocks (up to 32 blocks), and the starting block in the appropriate fields.
4. Click "Go".

**Lock One Block:**

1. Place a badge in the read field.
2. Select “Lock One Block” and enter the block number to be locked.
3. Click “Go”.



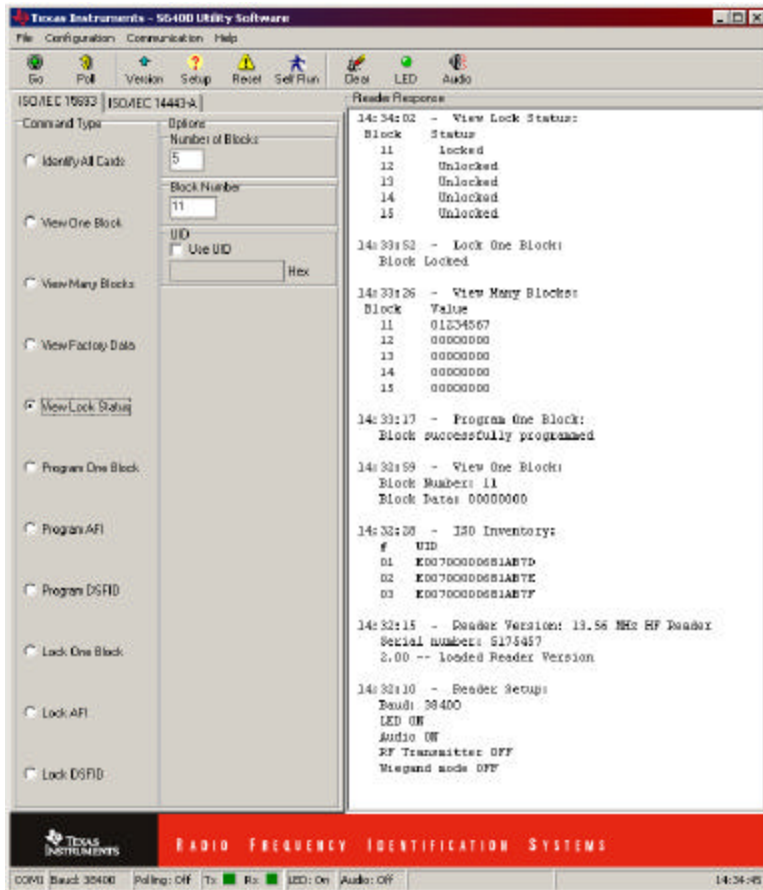
**Note:**

*Once a block has been locked, the data in that block is secure and can NEVER be changed. When locking blocks, a confirmation box will appear, as the action is irreversible.*

**View Lock Status of blocks:**

1. Place a badge in the read field.
2. Select “View Lock Status”
3. Enter the desired number of consecutive blocks, and the starting block in the appropriate fields.
4. Click “Go”.

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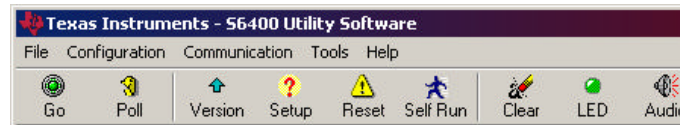


**Expected Results of Executed Commands**



## 9. The Software Toolbar

Frequently used commands are implemented into the toolbar at the top of the Host Software window.



*S6400 Utility Software Toolbar*

The “**Go**” button is used to execute the selected command.

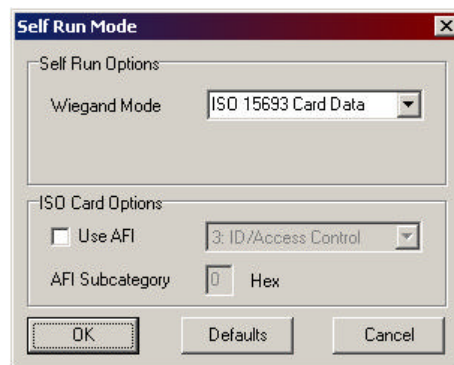
To continuously execute a command, select the “**Poll**” button prior to clicking “**Go**.” The “**Poll**” (continuous) option will remain activated until it is “**Stopped**.”

Clicking the “**Version**” button will cause the reader version, serial number, and reader firmware version to be displayed.

Clicking the “**Setup**” button causes the baud rate, LED status, audio status, RF transmitter status, and Wiegand status to be displayed.

The “**Reset**” button initializes the reader in a manner similar to cycling power. It resets specific parameters, but leaves some customizable parameters untouched. If ever a command is issued that causes the reader to stop responding, try clicking the “**Reset**” button.

Clicking the “**Self Run**” button brings up the Self-Run window.



*Self-Run Mode Window*

When placed in the default Self-Run mode, the unit outputs card data over the Wiegand data lines. The default setting is “ISO 15693 Card Data”. Selecting a

specific AFI (Application Family Identifier) will set a restriction, allowing only badges with the specifically selected AFI to be read.



**Note:**

Once a command has been issued over the RS-485 communication link, the unit will cease to operate in Wiegand (Self Run) mode. To return to Wiegand mode, click the “Self Run” button. Choose “ISO 15693 UID Card Data” (default) from the drop-down menu, and click “OK”.

Click the “Clear” button to clear the contents of the “Reader Response” window.



**Note:**

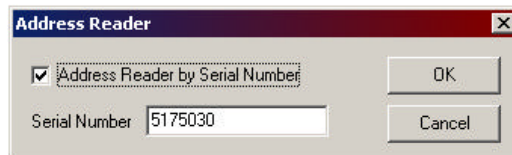
Data is buffered in the “Reader Response” window and can be reviewed by use of the scroll bar. As the buffer fills up, the software can become slow to respond. If the system seems to lag, try clearing this buffer by clicking the “Clear” button.

The “LED” and “Audio” buttons toggle the LED and Audio beeper response on and off, respectively.

The LEDs and audio transducer can also be individually activated through the host software using the “Activate” command from the file menu. LED color can be specified, along with activation duration in milliseconds.

## 10. Multi-drop Addressing

Reader serial number addressing allows multiple Readers (up to 100) to be operated in parallel on a single RS-485 bus. With multiple readers attached to the RS-485 bus, each reader can be individually addressed using the “Address Reader” command in the “Configuration” menu. In the window that appears (shown below), checking the “Address Reader by Serial Number” box, and entering the serial number for a specific reader on the bus causes all issued commands to be directed to that reader alone.



Reader Address Window



**Note:**

With multiple readers attached to the RS-485 bus, commands should not be issued unless a specific reader is addressed, as the readers do not currently support the use of “broadcast” commands.

To turn off reader addressing, uncheck the “address Reader by Serial Number” box.

## 11. Wiring Alternatives for Lights and Sound

Several operational alternatives exist for the LEDs and the audio transducer. The following table lists the associated wires.

| Optional Connections |           |
|----------------------|-----------|
| Orange               | Green LED |
| Brown                | Red LED   |
| Yellow               | Audio     |

Tying any of these wires to ground while the unit is powered will cause activation of the associated feature. For example, many existing readers have an LED which glows red by default when the reader is at rest. Tying the brown wire permanently to ground will cause the S6400 reader to have the same effect. In this state, upon activation by a card, the light will momentarily switch to green, and then back to red.

As another example, if the unit is tied to a controller, which momentarily unlocks a door, it may be desired to have the green light glow and the audio transducer sound for the duration in which the door is unlocked. Tying the yellow and orange wires to the (-) controller output to which the door lock is connected will produce this effect.

For more information regarding the optional wiring connections, including the hold feature, consult the User's Guide.

## 12. Self-Test Mode

The readers are equipped with a self-test mode that allows them to cycle through their functions and report the results through the LED. To put the reader into self-test mode, connect the following wire pairs together, then apply power to the reader.

|             |        |        |        |      |
|-------------|--------|--------|--------|------|
| Wire:       | Green  | Violet | White  | Blue |
| Connect To: | Orange | Brown  | Yellow | Gray |

Proper operation is indicated by the LED blinking green. The LED will turn to solid red and the unit will beep once within three seconds after a card is brought into the field. The flashing green light will return once the card has been removed from the field. See the User's Guide for more information about self-test mode.



### CAUTION:

The unit is not intended to operate in self-test mode indefinitely, as it operates above its standard duty-cycle. Leaving a badge in the field longer than 3 minutes while the unit is in self-test mode may cause the unit to overheat.

## 13. A Word About Encryption

“Wiegand Card Data” mode takes advantage preprogrammed DES encryption. Each reader is loaded with a proprietary master encryption key which is used to decrypt the data stored in blocks 0-4 of the preprogrammed badges. Card Programming software can be purchased separately, allowing the user to program badges using either the default master key, or a custom key. Badges programmed using a custom key can be read in “Card Data” mode so long as the custom key is selected and entered in the “Encryption” option under the “Configuration” menu.

## 14. References

For more information please refer to the following documentation available for download from the *Document Center* on the TI-RFid website:

<http://www.ti-rfid.com>

| Spec No.     | Title                          |
|--------------|--------------------------------|
| 11-06-21-711 | S6400 User's Guide             |
| 11-06-21-712 | S6400 Reference Manual         |
| 11-06-21-713 | S6410/S6420 Installation Guide |

## 15. Additional Resources

|  |                       |                                     |
|--|-----------------------|-------------------------------------|
| Please contact TI-RFid technical support service if you have any questions. Hours are Monday through Friday 8am-5pm CST. | USA                   | 1-888-937-6536<br>+1 (972)-575-4364 |
|  | e-mail                | rfidsupport@ti.com                  |
| International Support Numbers:   | Belgium (English)     | +32 (0)2 7455455                    |
|  | France (English)      | +33 4 93 22 22 00                   |
|  | Germany               | +49 (0)8161 80 2200                 |
|  | Italy                 | +39 (0)39 6568 210                  |
|  | Netherlands (English) | +31 (0)546 879 222                  |
|  | Spain                 | +34 902 19 73 96                    |
|  | Sweden (English)      | +46 (0) 8 58755527                  |
|  | U.K.                  | +44 (0) 1604 88 4088                |
|  | e-mail                | e-rfidsupport@ti.com                |

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## 16. Troubleshooting

This guide outlines some of the common issues experienced with the S6400 reader and host software. Please contact Technical Support for issues that are not addressed here.

| Symptom   | Cause   | Remedy  |
|---|---|---|
| Reader does not function in Self-Run or Wiegand mode  | Power issue   | Verify power supply is properly connected<br>Disconnect and reapply power to reader   |
|   | Incompatible, damaged, or un-programmed badge                     | Try another ISO/IEC-15693 preprogrammed badge   |
|   | Reader not set in Self-run mode                                   | Connect to PC and use host software to set the reader in Self-Run mode (p. 9)   |
| PC does not recognize reader<br><br>(Error: Message Timeout occurs)                         | Power issue   | Verify power supply is properly connected<br>Disconnect and reapply power to reader   |
|   | Serial cable connected improperly                                 | Verify serial cable is properly connected to RS-485 converter and computer's COM port   |
|   | Incorrect COM port selected                                       | Select correct COM port in software to which the reader is connected (p. 6)   |
|   | Incorrect baud rate selected                                      | Sequence through available baud rates in software until reader responds, then select desired rate (p. 6)<br>Hit the "Reset" button and cycle through baud rates again (p. 9)  |
| Reader responds incorrectly to software commands, firmware version is displayed incorrectly | Addressing turned on/Address set incorrectly                      | Turn off Reader Addressing in Configuration menu, or set address value to correct reader serial number (p. 10)  |
|   | Echo jumper on RS-485 converter set improperly                    | Remove echo jumper on RS-485 converter and place over pins marked "echo off" (p. 5)   |
| "View Many Blocks" reports "command not supported by reader"                                | Too many blocks selected for multi-block view                     | Only 32 blocks can be read at a time. Select 32 or fewer blocks and execute command again   |
| Only certain ISO/IEC 15693 badges recognized in Wiegand/Self Run Mode                       | Self-Run set to "Card Data" - Reader expects pre-programmed badge | To read ALL ISO/IEC 15693 tags, click "Self-Run" button, and select "ISO 15693 UID 26 bit"  |
|   | Reader set to recognize specific AFI                              | Click "Self Run" button, and select the desired Application Family Identifier (AFI). 30 is the standard AFI for Identification/Access Control. Uncheck "Use AFI" to allow the reader to recognize all ISO-15693 compliant cards in Wiegand mode |

## 17. Regulations

The S6400 system comprises a RF transmission device, and is therefore subject to national and international regulations. TI has obtained approvals from approval authorities in a number of countries and is continuing to apply for approvals in further countries. Actual status can be advised by customer support. In countries where approval has not been obtained, this system may be operated only under an experimental license issued by the relevant approval authority and must not be marketed. Before any such device or system can be marketed, an equipment authorization must be obtained from the relevant approval authority.

### **FCC Notices (U.S.A.)**

This equipment has been tested and found to comply with the limits for a Class A digital device and intentional radiator, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her expense.

Modifications to this device shall not be made without the written consent of Texas Instruments Incorporated. Unauthorized modifications may void the authority granted under Federal Communications Commission Rules permitting the operation of this device.

### **CE Conformity (Europe)**

A CE Declaration of Conformity is available for this system through customer support. Any device or system incorporating the S6400 reader system, in full or in part, in any other than the originally tested configuration needs to be verified against the European EMC directive. The System Integrator or user of such a system prior to marketing and operating it in European Community must issue a separate Declaration of Conformity.

For more information regarding regulations and endorsements, including CE, ETL, and FCC, please contact technical support directly.