LineLogix
RFID Conversion Line Solution
Technical Features
Rev F, 07Feb2013
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1. RFID Inspection

If you are producing RFID labels from label stock and inlays, you need to inspect your labels and verify that the inlays are still good after you convert them. The easiest thing to do is to run the finished labels past a reader, and check for the reader's "green light." That's slow, but it's the minimum investment path, and many companies are starting out that way.

1.1. Automated RFID Inspection

As you begin to automate your testing, you first need to look at the steps involved:

- Monitor the web position so you know when to read
- Trigger the reader when the tag is in the read zone
- Complete some operations on the tag before it leaves the read zone
- Determine whether the tag was good or bad
- Mark the bad tag before it gets away

Each of those steps involves instrumentation that may or not already be on your system. Since it's your system, you will need to develop the exact sensor placement and reader setup commands for every tag you handle. You will also need to work out the exact timing sequences for your PLC programmers to implement. And if you don't own the PLC, you'll be negotiating with the equipment company for every change.

1.2. Interference and Overruns

So, imagine you fight past all those issues and actually start running your system. What then? Well, first you find that you can't tell exactly which tag you're talking to. So now you're an antenna enclosure designer. Finally, everything is running great, and you start cranking the speed up, only to find that you are marking the wrong tags bad when the web exceeds some threshold speed.

1.3. The LineLogix Alternative

LineLogix is a standard platform for RFID conversion line automation. Using a combination of PC and realtime embedded software, it performs all the tasks outlined above, on different tag types, at high speed. It can tell when your line is running faster than your reader. The LineLogix Timing Control Unit (TCU) establishes the correct timing windows for reading and marking based on gap and position sensors. The TCU remembers how far your marker is from your reader, so the correct tag is marked, every time. LineLogixTCU also supports peel-and-replace equipment. LineLogixPC software configures it all, monitors the job, and reports the results.

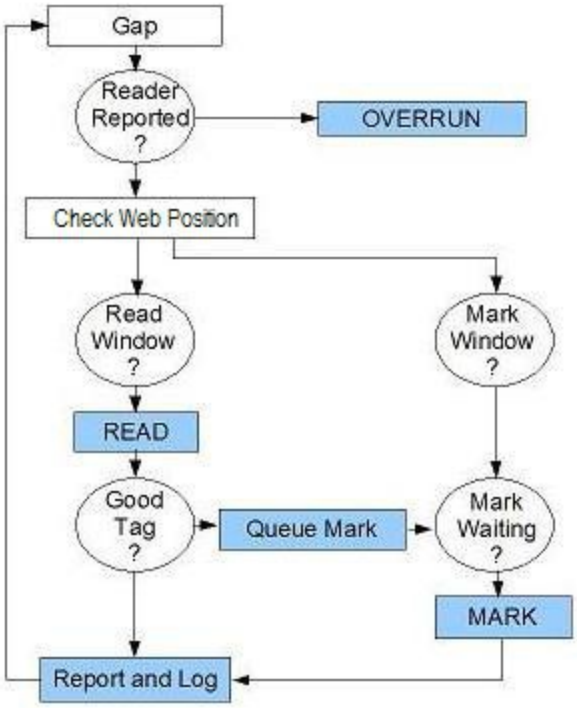
You choose:
Implement all that yourself on every tag type you process.
Or buy LineLogix.

1.4. Readers and Tags

LineLogix works with commercially available readers from Impinj, Skyetek, Feig and ThingMagic, allowing the choice of the best reader for your application. The system will work with any tag supported by the underlying reader.

1.5. Logical Flow

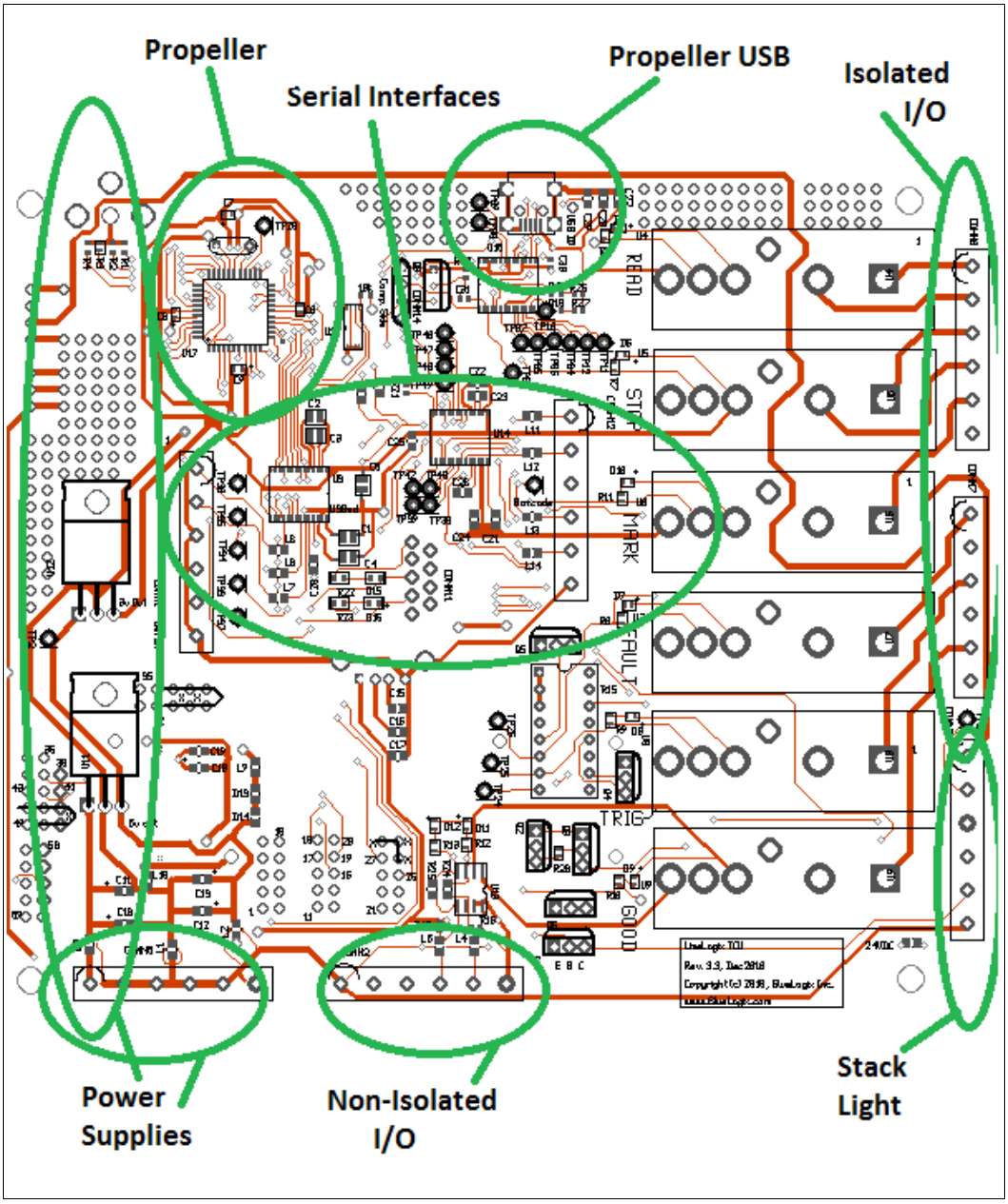
This is the high level logic flow of a typical LineLogix application. These functions are activated and configured by the LineLogixPC job file.

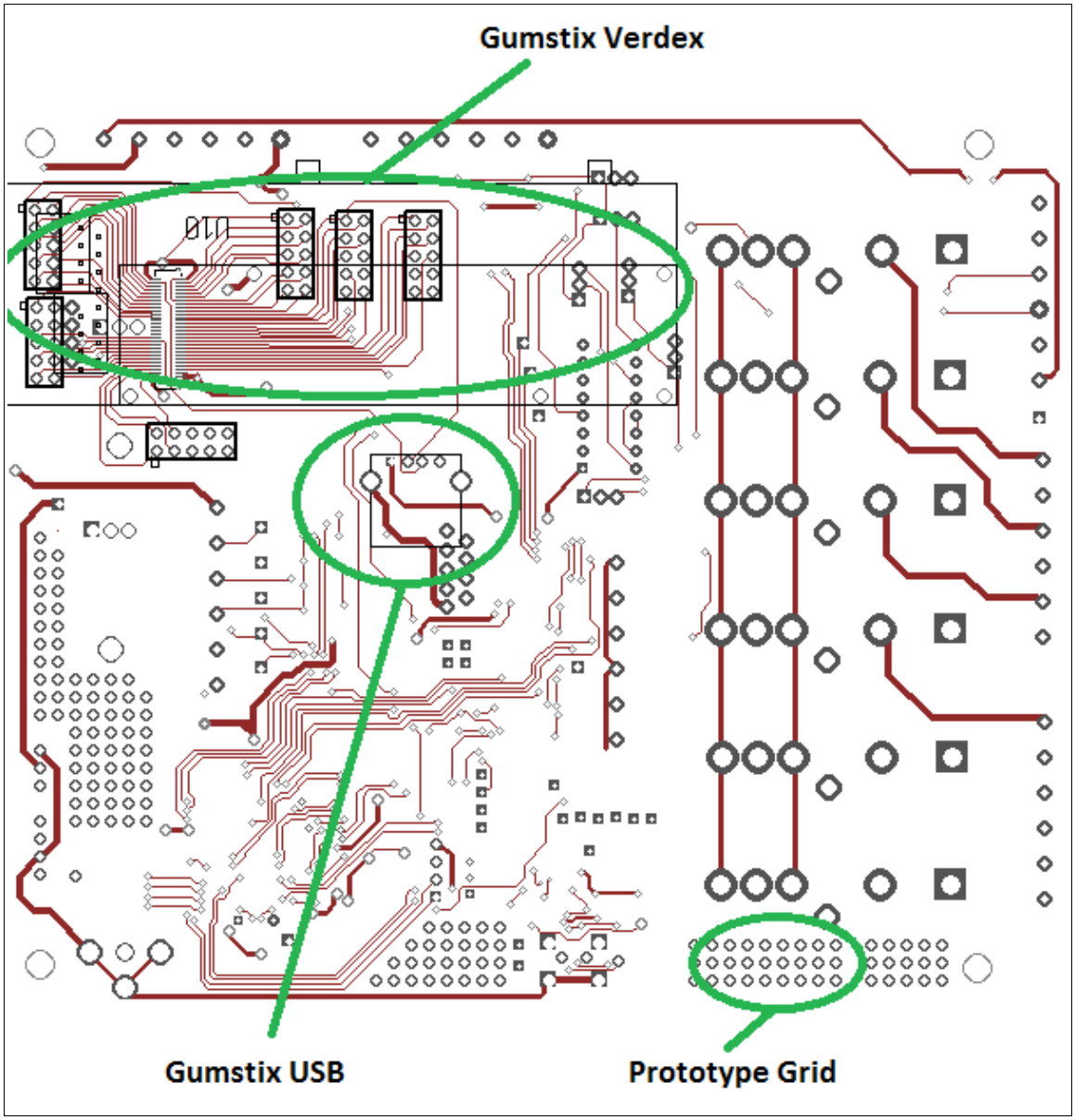


IP Note: The LineLogix system is protected by USA patents issued and pending. Some information disclosed in this document may be protected by patent law.

2. LineLogix TCU

The Timing Control Unit (TCU) is the heart of the LineLogix system. It is built around the Parallax Propeller multicore microcontroller. Clocking at 80 MHz, the Propeller furnishes I/O rates comparable to combinatorial logic, along with computations, making a control system vastly superior to a common PLC for RFID applications.





2.1. Electrical

2.1.1. Inputs

LineLogix uses an adjustable Gap Sensor to develop timing windows for Read and Mark operations. Some installations may also include a Position Sensor (shaft encoder). In standard installations, all sensors are integrated with the antenna into the LineLogix RFID Instrument Package (LineLogixRIP).

2.1.2. Outputs

The LineLogix application shown provides one output to the PLC: OVERRUN. If the reader does not reply to a Gap Sense event by the time of the next Gap Sense event, LineLogix sets the OVERRUN output. The host PLC can use this output to slow or stop the line.

With slight configuration changes, LineLogix can provide separate outputs for STOP and OVERRUN. The advantage of this is that STOP can then be used for routine functions like stopping the web for each tag, and OVERRUN can be reserved for exceptions. In this configuration, LineLogix has been used to convert conventional DC rewind tables into stop-start automated tag write stations.

2.1.3. Logic Levels

LineLogix can switch 0-24VDC or 0-115VAC. Standard I/O is via Grayhill industrial I/O modules, isolated from the control system ground.

Contact GlueLogix if you need other logic level or current loop interfaces.

2.1.4. Non-Isolated I/O

Level translation to and from 5 VDC is provided for interface to the optional shaft encoder. The circuit is normally not populated, but can be mounted for the shaft encoder or custom applications.

2.1.5. Power Supplies

In most applications, the TCU is powered by the power supply for the main reader. That is usually 9 or 12 VDC. Extreme low power operation frees up power supply capacity. Additional voltages of 3V3 and 24V0 are made on board.

2.1.6. Prototype Pins

Prototyping holes on 0.1 inch centers are provided throughout the TCU board, to support custom applications.

2.2. Data

2.2.1. Serial

The LineLogix TCU has standard connections for four (4) RS232 serial ports. All are set for 38400 baud, 8 bit, No Parity, 1 stop ("8N1"). Different baud rates are available for special applications. There is no standard mechanism for runtime adjustment of baudrates.

Port	Function
1	PC Setup and Logging
2	Main RFID Reader, usually UHF
3	Secondary RFID Reader, usually HF
4	In: Barcode Out: Variable Print

Variable print output is only enabled in custom applications.

An additional two serial ports are supported on test points, but are not normally wired to connectors. They are available for use by custom TCU firmware.

2.2.2. Propeller USB

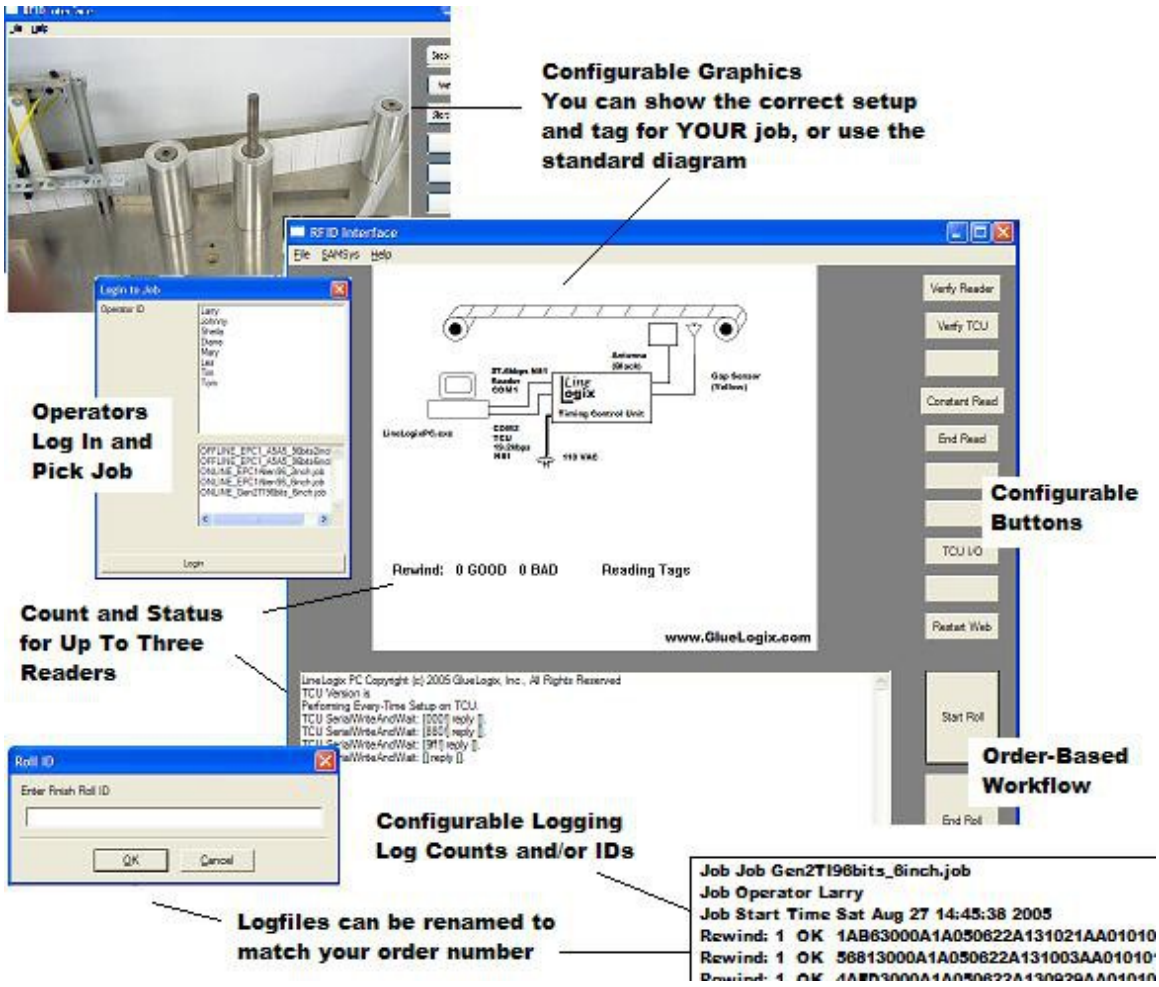
The USB interface is not normally populated, but can be provided for custom applications.

2.2.3. On Board Computing

The TCU supports an optional socket for a Gumstix Verdex Linux Computer on Module (COM). The Verdex line is obsolete as of 2013, but still available. The Verdex connector is not normally populated, but can be mounted for custom applications, along with a USB connector dedicated to the Gumstix.

3. LineLogixPC Software

LineLogixPC Software sets the reader and TCU up for each tag type and label size you process. Depending on your needs, the software can force operator login and job selection, or come up with default settings every time. The LineLogixPC display is centered around a bitmap that you help design. That means that LineLogixPC shows your operators how to set up the system.



3.1. Software Architecture

LineLogixPC is proprietary software, written in Python 2.7. Custom extensions, including programmable buttons, are implemented through Python code embedded in

configuration files.

3.1.1. Helper Applications

Some standard functions like Bulk Encoding are implemented via Helper Applications – separate programs that communicate with LineLogixPC via sockets. This architecture is especially helpful when devices needed for an application are best supported in different software environments. For example, some of the software libraries from Impinj for Bulk Encoding are provided in C++/MFC and others in .Net.

The socket based architecture also allows physical distribution of compute nodes.

3.2. Barcode Translation

GlueLogix has implemented extremely fast indexed lookup of data in Comma Separated Value (CSV) text files. Lookup in 128K record databases has been measured at 5 mS on PC and 2 mS on Gumstix Overo. The lookup facility is used to implement Barcode Translation, i.e., translation of data read from barcode to data to be written to RFID.

3.3. PC

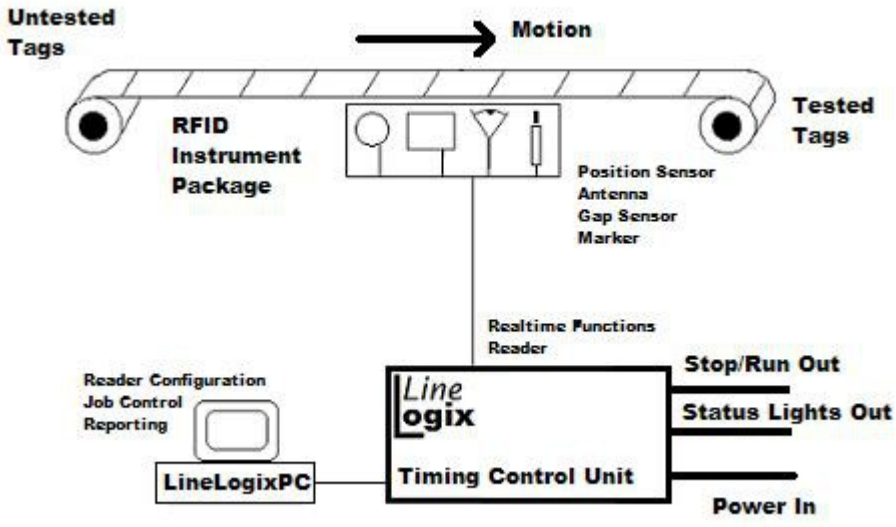
GlueLogix normally provides a PC suitable for each application, preloaded with all required software and tested with the provided hardware. For most systems, we provide an inexpensive Acer Aspire netbook.

All GlueLogix provided netbooks include LogMeIn software for remote management.

Standardization on the inexpensive netbook enables a worst case IT strategy. For sites that have no Internet access or IT support, software upgrades can be accomplished by swapping netbooks as a last resort.

4. The LineLogix Solution

LineLogix is a “bolt-on” package for RFID testing. It acts as a PLC on rewind equipment and supplements the PLC on presses. LineLogix shortens your RFID learning curve, making your shop more productive in less time.



LineLogix works with the widest range of tags, readers and peripherals. Contact GlueLogix for more options at LF through MW frequencies.

Tag	Thing Magic	Impinj	Feig
UHF Gen2	YES	YES	no
HF Gen2	no	no	YES
ISO 15693	no	no	YES
ISO14443-A	no	no	YES
ISO14443-B	no	no	YES
Kovio	no	no	YES (also Skyetek)
NFC Standard	no	no	YES

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