

Pack 1220

Pinewood Derby Track Upgrade

December 2005

Background

The Derby Track electronics served the Pack well since 1987. During the 2004 Derby races, there was a failure of the electronics. It was decided that the Pack should replace the system, and have a backup system.

The following were some of the considerations in selecting a new system:

- Easy for future leaders to maintain
- Use existing Track
- Replace all timing and electronics
- Re-Use parts if suitable
- No external Computer Software
- Finish Order display (numbers, not flashing light)
- External display (TV, laptop) as an optional 'nice to have'
- Have a Backup system – low cost, basic function

The final decision was to purchase 2 *off-the-shelf* systems:

- 1) A **Primary system** which displays **1-2-3-4** over the finish line
- 2) A **Backup system** that flashed a light over the winning lane

Both systems contain finish line functionality only. The purchased systems do not have control of the starting gates.

The original starting gates are utilized – with the addition of some timing relays for starting gate control. The interface between the 'new' starting electronics and the 'off-the-shelf' finish electronics is a single relay contract closure (a switch) indication the gates have gone down.

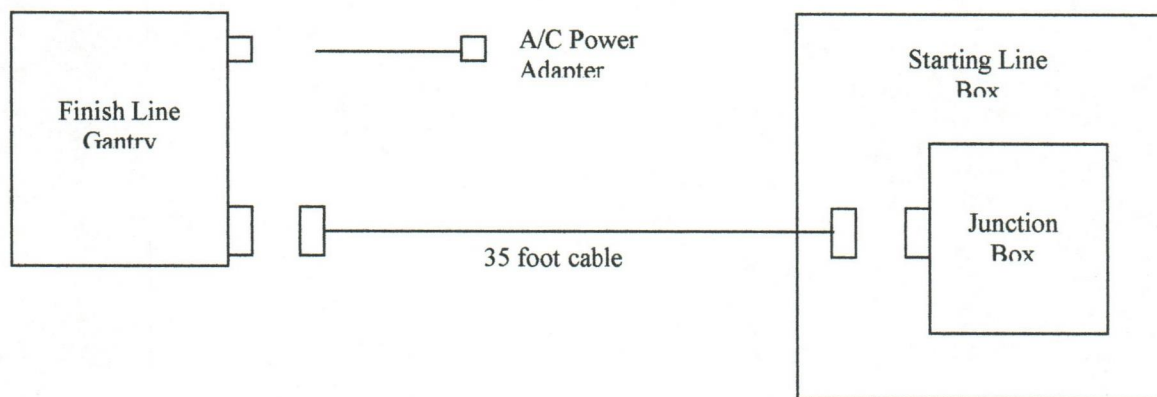
Primary System

Construction Notes

- For the Primary system, the finish Line timer was purchased from Microwizard as a kit (Model K2). Rather than build it as designed/provided, the electronics were incorporated into a new wooden gantry system. This will provide for more durability.
- Instead of using the provided gantry, a new wooden gantry was built. It has a similar look to the original gantry.
- The blue paint used was Ford Blue (sometimes called Ford Corporate Blue) engine paint. This is readily available at automotive stores. (The product used is by Plastikote, No. 224).
- The display was made to face away from the starting line. It was assumed that an external computer would be used to display results for scouts near the starting line.

SetUp

- Setup track with the primary gantry.
- The gantry gets power from a 110VAC power connection. An extension cord will be needed. An outlet in the starting cabinet is provided.
- A single cable connects the finish line gantry to the starting electronics.

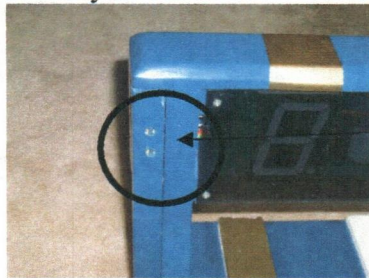


Finish Line Gantry

- The finish line gantry installs as part of the track as in the original design.
- 110 VAC power is required. A transformer converts to the necessary DC voltage and was supplied with the K2 system. In the event a new transformer must be purchased it should be available from Microwizard.
- An external contact closure (a switch) provides the reset mechanism for the K2 system. When closed, the previous race results are zero'd, and the timer waits for a new race to start. The opening of the switch is the trigger for the timer starting the new race. The race results will stay displayed until the switch is closed again.
- There is serial data port as part of the timer. This port is not needed for operation, however, can be utilized to display race results via an external computer. The timer can also be controlled via the serial interface – but for ease of use, this was not utilized.

Starting Controls

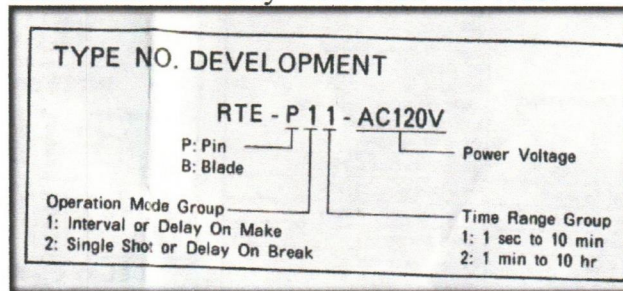
- The original starting gates utilize a solenoid to pull down the pegs and allow the cars start moving. The original design had a mode of operation where the left 2 lanes could be controlled separately from the right 2 lanes. With the redesign, the two gate pairs are controlled together, thus only a 4 lane race can be started. (Less than 4 cars can race – but all the gates are lowered.)
- Both the left START and right START buttons (on the starting box) will start the race.
- A convenience START port was included in the finish line gantry. An external cable with a momentary switch can be plugged in the gantry. This allows the race to be started from the finish line. Pressing the switch from this port has the same functionality as the START buttons on the starting box.



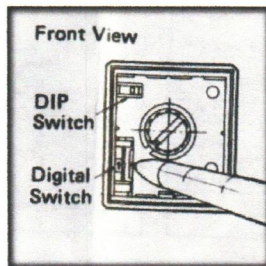
- 2 Timing relays are used.
 - Start Delay Timer - One timing relay controls the timing between pushing the START button and when the gates go down. (Left timer).
 - Gate Down Timer - The second timing relay controls the duration the gates remain down. (Right timer).

- Delay Timer setting.

Timers are *idec* relay - RTE-P21-120VAC.



Operating Mode Group –2
Time Range Group – 1



Start Delay Timer

DIP switch position right (Delay on Break)
Digital Switch position 3 (0-10 seconds)

Gate Down Timer

DIP switch position left (Single Shot)
Digital Switch position 3 (0-10 seconds)

The dial can be turned for both timers – adjusting from zero to 10 seconds.

See timer specs for additional info.

- Sequence of Starting Events
 1. Previous race has completed. Finish order is displayed. Cars for next race are placed at Starting position. The contact closure input to the Finish Line Electronics is open.
 2. Push either left or right side START button momentarily. Finish line displays 0. 0. 0. 0. (note the decimals points are lit).
 3. There will be a delay before the gates lower. This time is adjustable using the dial on the Start Delay Timer. During the delay, an LED on the timer is lit.

4. After the start delay, the Gate Down timer triggers 2 events simultaneously.
 - Race time starts – Display now shows 0 0 0 0. (note, the decimal point is no longer lit.) The contact closure is closed.
 - Gates go down for the time set the Gate Down Timer. This is adjustable using the dial on that timer.
 5. At the end of the Gate Down Delay
 - The closure is opened, and will stay open until the race sequence is started over. Note that opening this contact closure does not re-set the race order.
 - The Starting Gates raise. At this time the cars for the next race can be placed at the starting position.
 6. Before the cars cross the finish line, the start buttons can be pushed again. However, this should be avoided as it will reset the timer and most likely, the race order will not be recorded correctly. This is NOT RECOMMENDED.
 7. The cars cross the finish line and the order of finish will be displayed.
 8. If the serial port external interface is used, the race order and times for each car will be displayed.
 9. The next race can be started at any time – the race results will stay displayed until the start button is pushed again.
- If before the race starts, or during the race, any of the lanes display a “-“, there is a problem with the lane and must be troublehotted.
 - Races with less than 4 cars – the order of finish will be displayed, with the missing cars left as zero. If the Display Software is used, it will not display the finish unless 4 cars finish. Alternatively, a small block of wood can be placed over the unused lane prior to the race if desired to eliminate that lane.

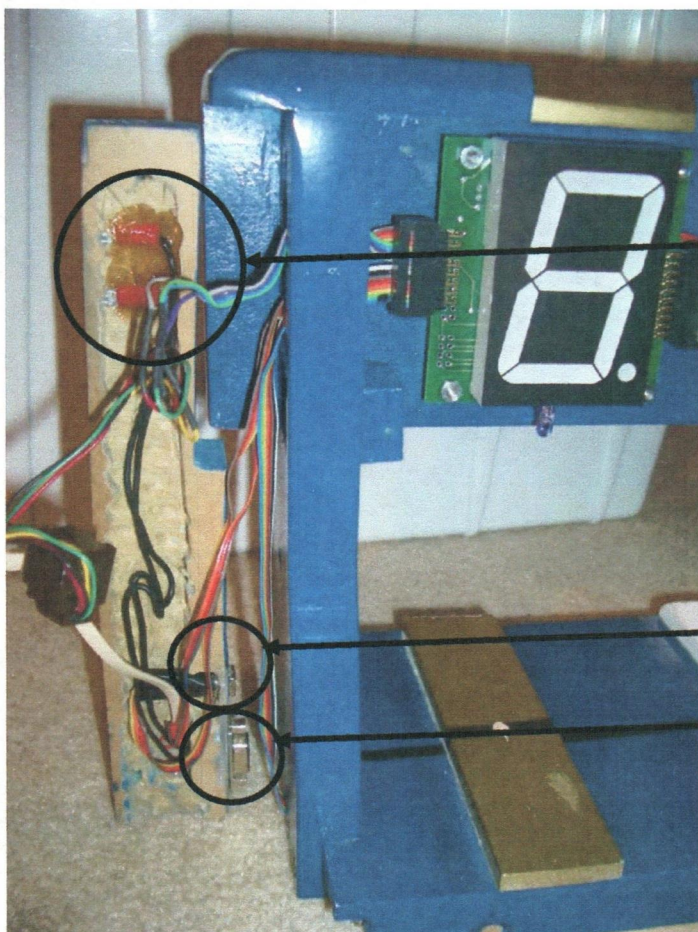
Running the Display Software

- System Requirements – Windows XP or greater
- Starting the software
 - Double click on the icon *PinewoodTRACKer*
 - Enter the Pack number and click OK
 - COM1 is the default. This can be changed by selecting
 > Tools >Communication Setup
- Sequence of events
 - When the start button is pushed, the display will show zeros
 - When the last car crosses the finish line, the race times will be displayed
 - The winning lane will flash
- Races with less than 4 cars
 - Placing a block of wood over the sensor of the unused lane will cancel out that lane
 - If the unused lane is not cancelled prior to the race, someone must manually wave their hand thru the finish line to ‘finish’ the race.
- The software interface for the K2 system is described in the K2 Manual.

Assembly/Disassembly

- The K2 electronics (PC boards, cables, connectors) could have been modified for incorporation into the gantry. However, it was kept in tact to (hopefully) maintain the warranty; and if in the event a repair from the manufacturer is needed, it can be returned in the state the manufacturer provided.
- The K2 electronics can be accessed by removing the black LEXAN cover on the rear of the finish line gantry.

- Pictures of the semi-installed electronics:



Convenience Start port

Power connector

Connector to Starting Box

Backup System

Construction Notes

- The finish Line timer was purchased from Microwizard as a kit (Model K1). Rather than build it as designed, the electronics were incorporated into the existing, wooden gantry system. This will provide for more durability.
- The Pack's original finish line gantry was modified by installing an extension to the top of the gantry.

Setup

- Same as the Primary system, with the exception of the cable
 - A phone cable connects on one end to the gantry
 - At the starting line, remove the RJ11 connector (phone connector) at the junction box.
 - Connect the RJ11 connector to the phone cable using a female-female connector.
 - Races can be run without this cable – the K1 system re-sets itself 15 seconds after a race is complete.

Finish Line Gantry

- The finish line gantry installs as part of the track.
- 110 VAC power is required. A transformer converts to the necessary DC voltage and was supplied with the K1 system. This is the same transformer as the K2 (Primary) System.
- An external contact closure (a switch) provides the reset mechanism for the system. This works the same as the Primary system and has the same interface.
- There is no serial data port as part of this timer. (The K1 electronics actually has a serial interface, but the option was not purchased – so at the end of each race the timer transmits an ASCII 'X', not the race results.)

Starting Controls

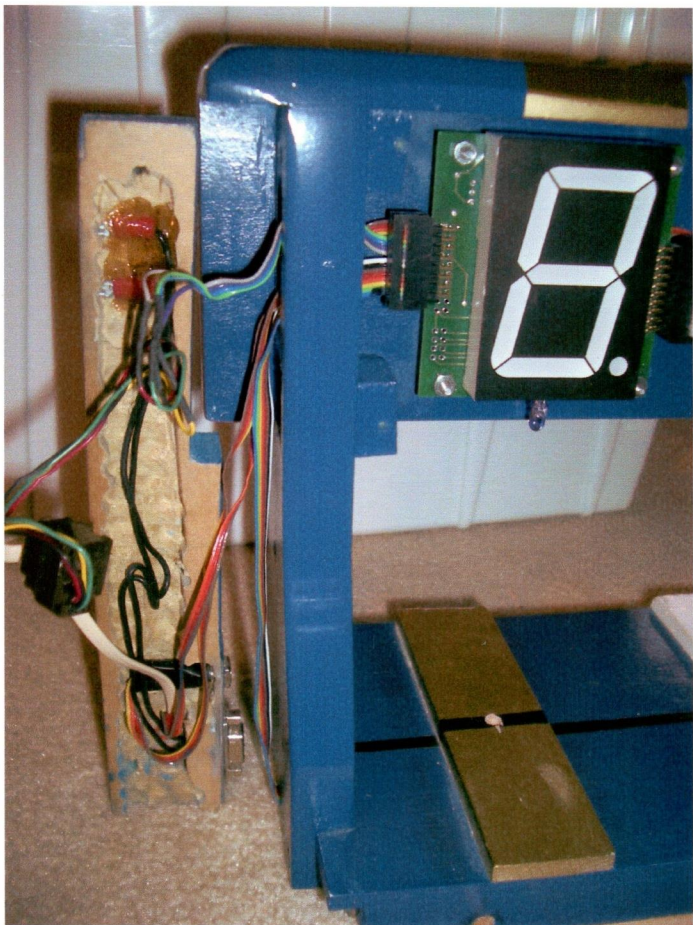
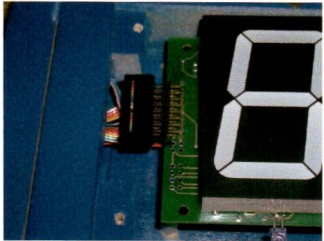
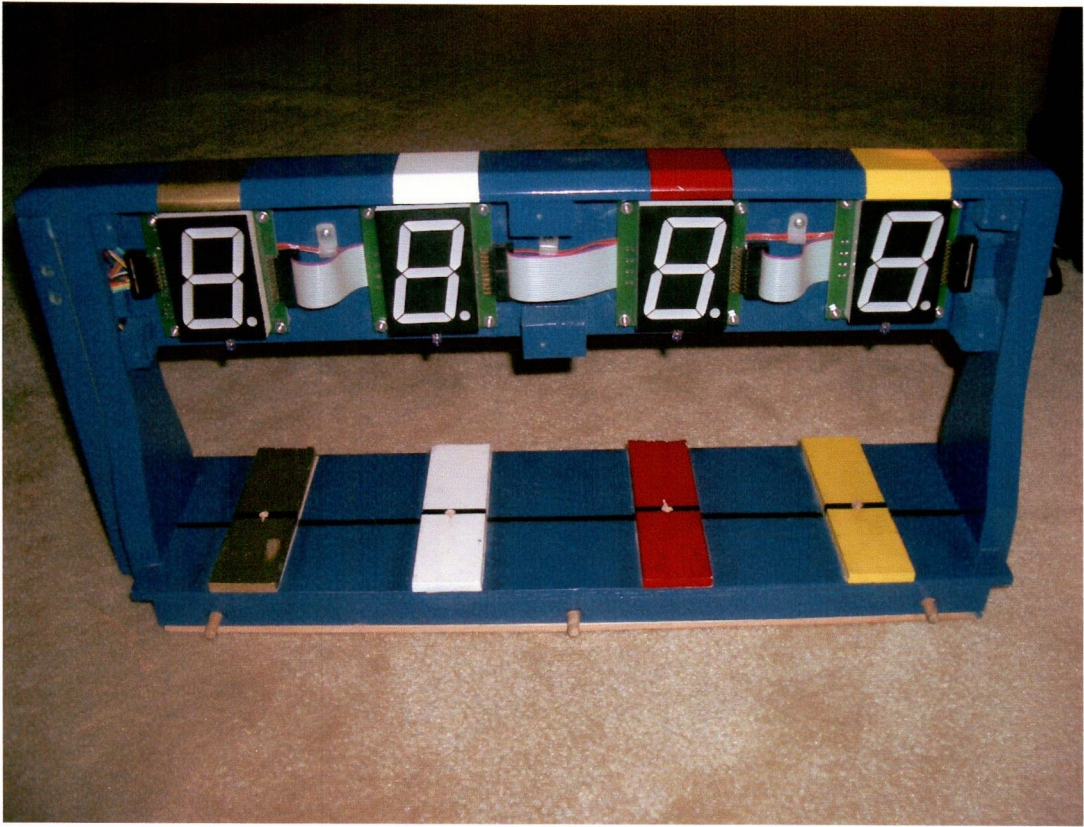
- The Backup System operates the same as the Primary system with one notable exception – it does not display the order of finish.
 - The **first** car to cross the finish line – light stays illuminated
 - The **second** car – light flashed fast
 - The **third** car – light flashed slow
 - The **fourth** car – light flashes once as the car crosses the finish line.
- **Note that the race results only stay illuminated for about 15 seconds after the race is complete. At this point, the K1 system does not need the contact closure to start the electronics – it is ready.**

Assembly/Disassembly

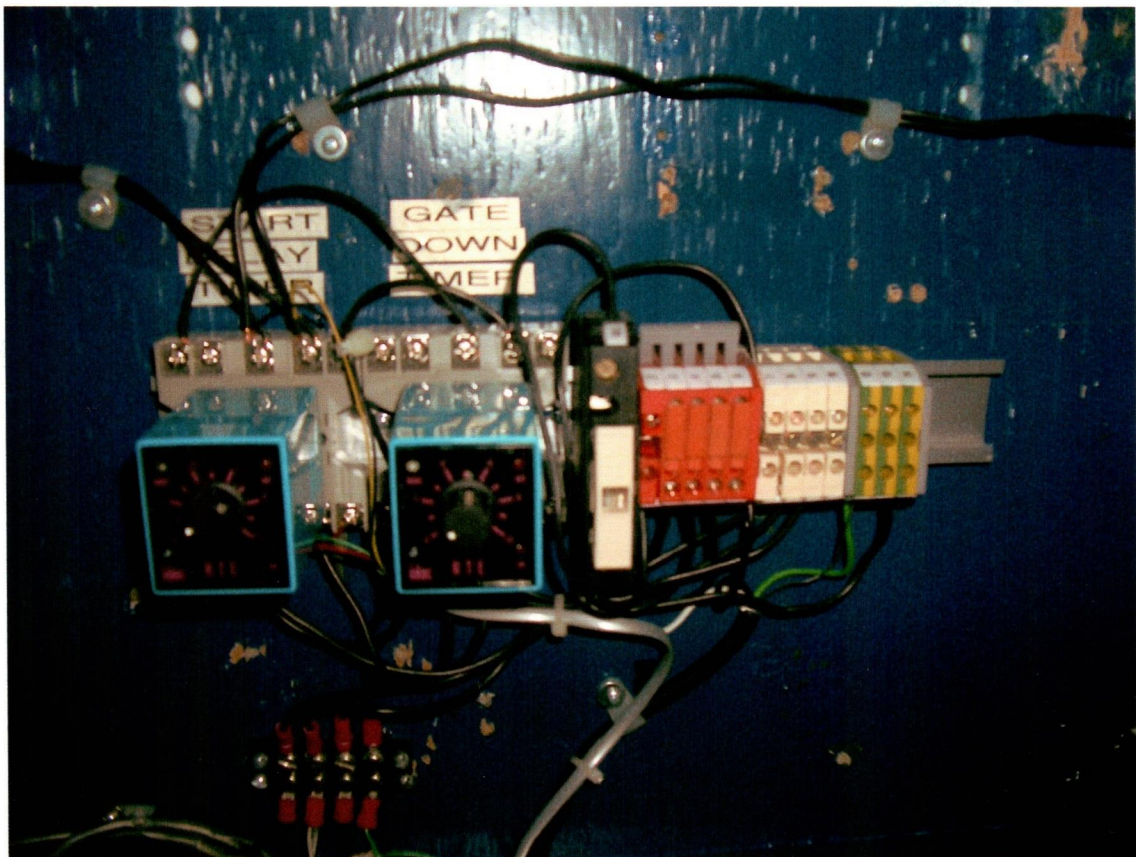
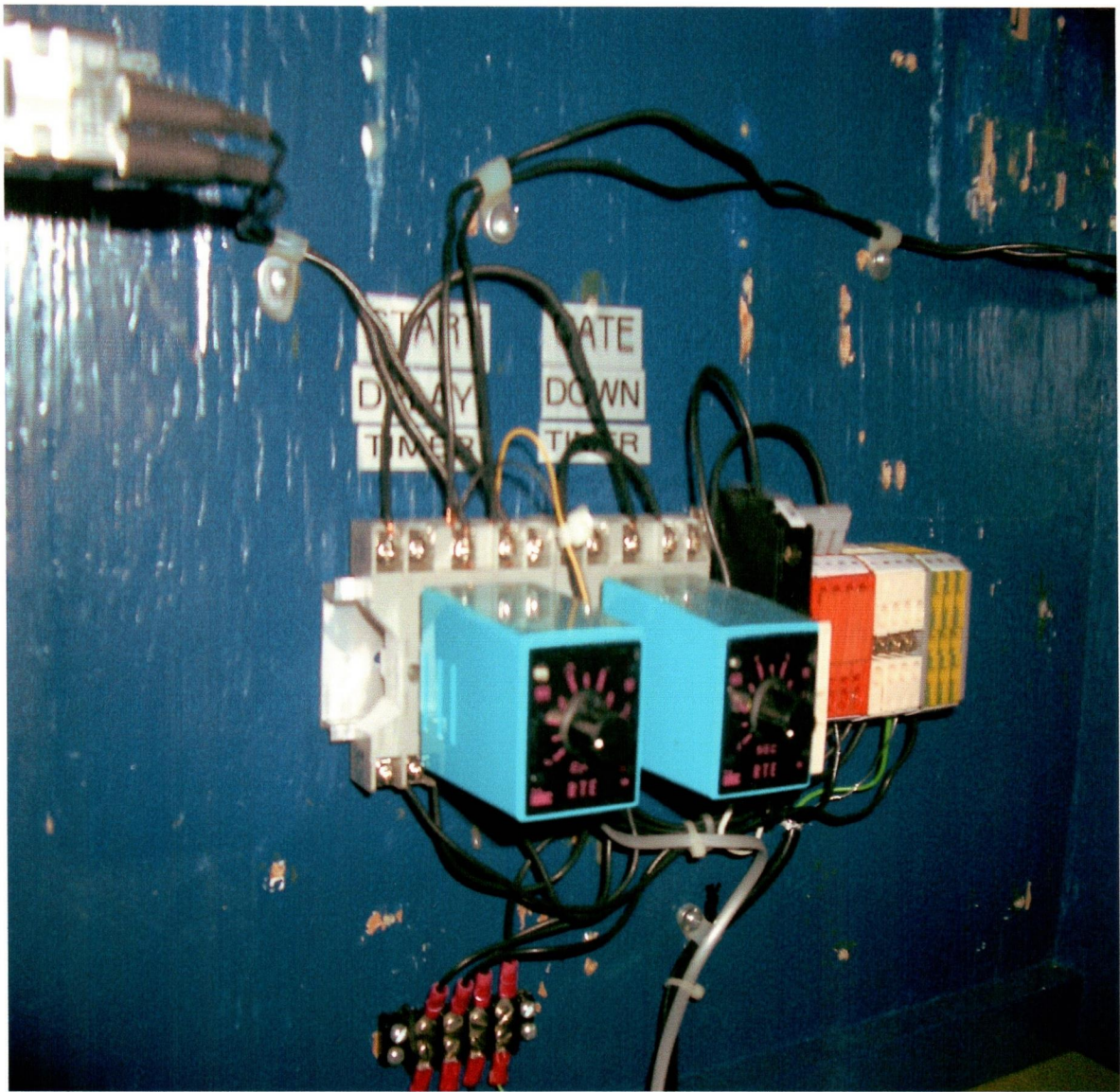
- The K1 electronics (PC boards, cables, connectors) could have been modified for incorporation into the gantry. It was kept in tact to (hopefully) maintain the warranty; and if in the event a repair from the manufacturer is needed, it can be returned in the state the manufacturer intended.
- The K1 electronics can be accessed by opening the top cover. Unfortunately, removing the electronics assembly is not simple. The order for removal is:

Resources

www.microwizard.com



Primary Gantry System



Timing Relays