1.0 INTRODUCTION

This document will cover the theory of operation and specification for the GDO 98 firmware and pcb assembly. Refer to block diagram 214738 and schematic 214739 for this discussion. The functions of the operator should be the same as current pegasus control board wih the exception of the learn mode (on board radio), the diagnostic mode and the I/R beam. The operator must be UL325 compliant and F.C.C. part 15 approved.

2.0 DOOR OPERATOR FUNCTIONS

Use same parameters as current controller
When unit is powered up, door always goes in up direction until limit is reached
Door always goes in opposite direction when operated
Operator only looks at beam input when door is going down
Operator looks at motor speed (torque) whenever motor is running (after 800 msec)
When door is going down and hit obstacle, it reverses
When door is going up and hits obstacle, it stops
When push button is held down, beam is ignored
An overall time out of 25 seconds will also stop the door in either direction
A maximum of 10 transmitters will be stored in EEPROM
If door operation is stopped or not started due to an error condition,
Operator light and LED will flash out a diagnostic code

Diagnostic Conditions:
Learn in transmitter – flash 1 time
Beam Failure (door stopped because of beam break) – flash 2 times
Motor speed sensor failure (door stopped because of torque) – flash 3 times
No RF due to Vacation Mode (door won't open with radio) – flash 4 times
Pushbutton/Wall Station Wire Shorted (see definition below) – flash 5 times
Operator time out failure (door stopped because of long run time) – flash 6 times

Flash rate to be ½ sec on and ½ sec off
Only one failure code will be flashed if multiple errors (priority to fewer flashes)

Pushbutton /Wall Station wire shorted to be determined by the following:
If operator is started by radio reception and the button measures open/close door input level, then flash diagnostic code

3.0 OPERATIONAL MODES

The operator shall use the following input/output assignments and timing parameters.

Radio:
Input from radio receiver

Megacode pulse position modulated format
1000 usec nominal - 6 msec frames – 23 frames in each word
256 usec sampling rate
Pulse and gap timings per Megacode chart (as close as possible)
Input on RB0 pin
Data will be decoded after receipt of first valid word
A new transmission will be assumed if there is no RF activity for 2 words

Wall Station:
Input from push button or wall station or external add-on radio
Debounce 80 msec

I/R Beam:
Inputs a 1000 usec positive pulse every 11 msec if good
If low, beam is not connected or not aligned (bad)
If any missing pulse beam has been interrupted
Input on RA4 pin

Tachometer Detector:
Inputs a 1 msec negative pulse approx every 5 msec
Indicates the motor speed
Must let settle for 800 msec after motor is started
Average the tachometer period over 16 measurements
Make a reference measurement and compare to current speed
Door is stopped if motor speed is slower than torque setting
Use same torque curve as current unit
Input on RB4 pin.

Up Limit:
Shows when door has reached the upper limit of travel
Input low when at limit
Input on RA1/AIN1 pin

Down Limit:
Shows when door has reached the lower limit of travel
Input low when at limit
Input on RA0/AIN0 pin

Up and Down Torque:
Input is Up Torque adjustment when up motor relay is turned on
Input is Down Torque adjustment when down motor relay is turned on
Perform an A/D conversion
Use internal reference for a "4 bit" A/D
Allow for reference settling time
Input on RA3/AIN3 pin (comparator mode)

Learn Switch and Radio LED:
Input and Output
If input, reads learn switch if low
If output, lights LED if low
Switch and LED will operate as follows:
Push switch for 0 to 2 seconds – learn a transmitter
Push switch for 10 seconds – delete all transmitters
Flicker LED when RF is busy
Flash LED for diagnostics
Input/output on RB5 pin

I2C Clock:
Output to EEPROM
Output on RB7 pin

I2C Data:
Input/Output to EEPROM
Output on RB6 pin

Motor Up:
Output to activate motor in up direction
Output on RB3 pin

Motor Down:
Output activate motor in down direction
Output on RB2 pin

Light Relay:
Output to turn on light
Output on RB1 pin

4.0 CIRCUIT DESCRIPTION

Power Supply:
A.C. power is supplied to T1 through J1-9 and J1-15. RV2, RV3 and R19 provide surge protection. Output of T1 is bridge rectified, filtered by C21 and is used as the 24 V.D.C. unregulated supply. 5 volt regulator (U2) supplies regulated power to microprcessor (U3) and to radio.

Radio:
Transmitted RF signals are received through an antenna wire attached to the PCB. This signal is coupled through an RF buffer, Q1, and preamplifier, Q2, and capacitively coupled to the top of the tuning tank of the super-regenerative detector, Q3. The detector operates as a self-quenching oscillator responding

logarithmically to the signal amplitude at the moment oscillation commences. To reduce radiated energy from the detector, the primary feedback path for the oscillator is C9, which is in close proximity to Q3. In addition RF stage Q1 provides additional isolation between the antenna and the regenerative detector circuit.

The detected audio signal is low-pass filtered by R11 and C15, amplified by U1C, and detected by U1D, an input offset is created by R14 and R15. Additional low pass filtering is done with R16 and C19, and output buffering by U1F and U1E.

The output pulse train signal from U1 is distributed to the micro-processor U3 for decoding.

Wall Station:
Wall station power is supplied by constant current source Q4, Q5. Voltages developed by switches in wall station are scaled by R23 and R27 and applied to U3-1. D6, D8 and R24 provide surge protection.

I/R Beam Input:
Beam power to the emitter and detector is supplied by R39. Pulses from beam are level shifted and inverted by Q9 and applied to U3-3. D13, D14 and R42 provide surge protection.

Tachometer:
R30 supplies power to the emitter (J1-2). R29 (J1-1) is the pull up for the detector and applied to U3-10 through R31.

Up/Down Limit:
The up/down limit (J1-4, J1-5) switches supply ground to U3-18 and U3-17. R21 and R22 are the pull up resistors. R25 and R26 provide surge protection.

Up/Down Torque Adj.:
Power is applied to up torque potentiometer when up motor relay is energized. Resultant voltage is applied to U3-2 for A/D conversion. Down torque setting is measured in same manner when down moter relay is energized.

Learn Switch/LED:
Learn switch and LED share the same port U3-11.

EEPROM:
Eeprom (U4) is connected to U3-12 and U3-13 using IIC interface.

Relay Control:

U3-7, U3-8 and U3-9 control the light relay (K1) the up motor relay (K2) and the down motor relay (K3). These relays distribute the A.C. to J1-12, J1-13 and J1-14.

5.0 SPECIFICATIONS

Model: GDO 98
Part Number: AAE00406

RF Center Frequency:	318 MHz ± 500 KHz.
RF 3 dB Bandwidth:	6 MHz typical
Sensitivity:	-91 dBm, min., -93 dBm, typical
Emissions:	FCC Part 15 Compliant
RF Modulation:	A1D PPM, @ 150 BITS/SECOND
Encoding Technique:	Linear Megacode
Number of Codes:	1,048,576 unique codes
Power Requirements:	.115 vac
Operating Temp. Range:	0°C to 50°C.
Storage Temperature:	-55°C to +85°C

ALL SPECIFICATIONS ARE NOMINAL

Radio Standard Specification
Low Power Communication Devices
FCC Rules Part 15, Subpart B

1.0 General:

1.2, Exclusions to TV Broadcast Freq.	N/A

2.0 Related Documents:

Reference Documents for Application:	CFR 47, Parts 2 & 15 ANSI/IEEE C63.4-1992

3.0 Test Equipment:

Supply Voltage:	120 VAC, Line Operated Device
Test Equipment List	See Report of Measurements
Signal Detector:	Peak Signal Reported

4.0 Certification and Test Results:

Summary of Results	See Page 1 of this section

5.0 General Technical Requirements:

5.1 Testing Methods:	Peak Signal
5.1 Reference Standard:	C63.4-1992 (IEEE Procedure)
5.3 External Controls:	No user serviceable parts
5.4 Accessories:	None Required
5.5 Detector Bandwidth:	< 1 GHz = 100 KHz (minimum) > = 1 GHz = 1 MHz (minimum)
5.6 Equipment Labels:	See Label Facsimile
5.7 Manual Disclaimer:	Complies
5.9 Usage Restrictions:	Digital Pulse Code Only

6.0 Receiver Characteristics and Tests: