LOFA MC536 Programming Manual

Introduction

This document provides general information on LOFA Industries MC536 configuration. MC536 control systems are a very flexible platform for diesel engine control, monitoring, and protection, featuring LOFA's powerful First Fault Diagnostics (FFD). After pinpointing the initial failure, FFD stores it in memory and alerts the end user via a single bright LED. FFD monitors battery charge, low oil pressure, high temperature, overspeed and up to two additional contact closure inputs. The field configurable microprocessor-based solid-state design uses high-power semiconductors instead of outdated electromechanical relays to ensure reliable high-current switching.

The MC536 is field configurable with an inexpensive programmer. Some of the MC536 configurable features include:

- Automatic preheat duration
- Failure indication with shutdown or indication only
- Starter motor protection
- Over-speed shutdown
- Normally open or normally closed shutdown switches

The standard system includes a 12 inch wiring harness terminating into a sealed weatherproof plug. This durable connection performs well in harsh environments and provides efficient installation of custom plug-and-play engine harnesses as well as standard harness extensions.

Warning

When replacement parts are required, LOFA Industries recommends using replacement parts supplied by LOFA or parts with equivalent specifications.

Failure to heed this warning can lead to premature failure, product damage, personal injury or death.

Operation

Turning the control system key to the run position starts a self-test which causes all LEDs to flash three times and enables the fuel run/stop solenoid output. After self-test, the LEDs indicate the state of the inputs they monitor. The normal indications are battery charge and oil pressure on most applications. If these LEDs are not illuminated at this time it may indicate the inputs are not properly connected.

The *Preheat* LED is illuminated when the key switch is turned to the run position if automatic preheat is configured (See Preheat Options). Preheat time varies from application to application. After waiting for the *Preheat* LED to extinguish, the engine is cranked by turning and holding the key switch in the start position until the engine starts. The key switch is spring loaded to return automatically to the run position when released. The *Preheat* LED is illuminated during afterglow if enabled.

Note

The key switch is equipped with a mechanical start locking device. An attempt to re-crank the engine can only be made by turning the key switch to the off position to reset the start locking mechanism.

If the engine is not started within 30 seconds of turning on the system, the fuel run/stop solenoid output is turned off to prevent battery discharge when the key switch is left in the run position. The fuel run/stop solenoid output is turned off after 30 seconds even if preheating. As soon as the key switch is turned to the

start position the solenoid output is enabled. The afterglow cycle begins when the key switch returns to the run position.

Note

If conditions do not warrant preheat, the engine may be started by turning the key to the start position without waiting for the preheat time to expire.

Control system instrument power, including the hourmeter and voltmeter, is provided by the fuel run/stop solenoid output. If the instruments do not power up when the key is turned to the run position, this indicates a problem with the solenoid circuit.

After the engine starts, the control system electronics ignore all shutdown conditions for the first 10 seconds. This delay eliminates the requirement to hold a by-pass override button during starting and allows the system conditions such as oil pressure to normalize. The 10 second timer starts when the key switch returns to the run position.

Note

Starter input is required for correct system operation. If the starter motor input is not activated (connected to battery positive) and the engine is started through another means (i.e. air starter) the engine will shutdown 30 seconds after the key switch is turned to the run position.

To prevent unintentional engine shutdowns caused by intermittent conditions (i.e., pressure spikes, coolant movement) the control system requires a constant 1/3 seconds fault input to cause engine shutdown.

Warning

When used in combination with mechanical float type switches engine vibrations may prevent constant contact closure.

The control system has the ability to shut down the engine for over speed. Over speed is indicated via a blinking *Battery Charge* LED. The control system senses RPM by either the frequency terminal of the alternator or a proximity switch.

Preheat Options

Preheat Output

Preheat is a 20A positve output for control of an external power relay with predetermined preheat and afterglow times. A relay should be selected with appropriate amperage capacity for the installed cold starting aid (glowplug, intake air heater, etc.). Applications using multiple cold starting aids may require multiple relays. An optional external thermistor can be use to disable preheat if the temperature is above 32° F (0° C).

Note

Consult engine documentation when selecting cold starting aid, power relay and heating specifications.

Programming

Programming is accomplished by connecting the *MC536 Programmer* to the MC536. The programmer connects to the 3-position connector on the board and the black wire from the programmer needs to be connected to panel ground.

To enable programming, hold the *Set* button and activate Ignition (15) within 2 seconds. Programming mode is indicated by blinking of all 6 LED followed by all LEDs extinguished. Pressing the *Plus* button moves to parameter 1, *Solenoid Function*, as indicated by the flashing OK LED. No outputs are active during programming.

All programming parameters are selected by the parameter number using *Plus* and *Minus* buttons. Pressing the *Set* button displays the parameter value (e.g. ETR if *Preheat* LED illuminated) and can be changed with the *Plus* and *Minus* button. Pressing *Set* again stores the parameter value and the parameter number is indicated again. All values are indicated binary through the LEDs, where the *OK* LED is the least significant bit. See the tables below for details.

Parameter numbers are represented by flashing LEDs and parameter values are represented by solid LEDs. The parameter values are stored when power is removed at the end of programming.

The following parameter charts define the LED light patterns. The Version 1.0 chart is only for software version 1.0. All other software versions use the Version 1.1 and greater chart.

Note

The software version is indicated by a label on the top of the processor.

Parameters (Version 1.0)

No.	Description	Parameter Number (binary)						Factory Default
		Preheat LED (Amber)	Aux LED (Red)	Temp LED (Red)	Oil LED (Red)	D+ LED (Red)	OK LED (Green)	
1	Solenoid Function	○	○	○	○	○	☼	ETR
2	Overspeed Monitoring	○	○	○	○	☼	○	Disabled
3	Preheat Time – 10s	○	○	○	○	☼	☼	0
4	Preheat Time – 1s	○	○	○	☼	○	○	0
5	Start Frequency - 1000s	○	○	○	☼	○	☼	0
6	Start Frequency - 100s	○	○	○	☼	☼	○	2
7	Start Frequency – 10s	○	○	○	☼	☼	☼	0
8	Overspeed Frequency – 1000s	○	○	☼	○	○	○	0
9	Overspeed Frequency – 100s	○	○	☼	○	○	☼	0
10	Overspeed Frequency – 10s	○	○	☼	○	☼	○	0
11	Temperature Switch/Sensor	○	○	☼	○	☼	☼	Switch
12	Temp Switch Fault	○	○	☼	☼	○	○	Ground
13	Oil Switch Fault	○	○	☼	☼	○	☼	Ground
14	Alternator Fault	○	○	☼	☼	☼	○	Ground
15	Aux 2 Switch Fault	○	○	☼	☼	☼	☼	Ground
16	Aux 1 Switch Fault	○	☼	○	○	○	○	Ground
17	Alternator Shutdown	○	☼	○	○	○	☼	Enabled
18	Aux 2 Switch Shutdown	○	☼	○	○	☼	○	Enabled
19	Aux 1 Switch Shutdown	○	☼	○	○	☼	☼	Enabled
20	Programming End	○	☼	○	☼	○	○	

Legend

LED off	○
LED Blinking	☼
LED on	●

Parameters (Version 1.1 and greater)

No.	Description	Parameter Number (binary)						Factory Default
		Preheat LED (Amber)	Aux LED (Red)	Temp LED (Red)	Oil LED (Red)	D+ LED (Red)	OK LED (Green)	
1	Solenoid Function	○	○	○	○	○	☼	ETR
2	Overspeed Monitoring	○	○	○	○	☼	○	Disabled
3	Preheat Time – 10s	○	○	○	○	☼	☼	0
4	Preheat Time – 1s	○	○	○	☼	○	○	0
5	Start Frequency - 1000s	○	○	○	☼	○	☼	0
6	Start Frequency - 100s	○	○	○	☼	☼	○	2
7	Start Frequency – 10s	○	○	○	☼	☼	☼	0
8	Overspeed Frequency – 1000s	○	○	☼	○	○	○	0
9	Overspeed Frequency – 100s	○	○	☼	○	○	☼	0
10	Overspeed Frequency – 10s	○	○	☼	○	☼	○	0
11	Temperature Switch/Sensor	○	○	☼	○	☼	☼	Switch
12	Temp Switch Fault	○	○	☼	☼	○	○	Ground
13	Oil PSI Switch Fault	○	○	☼	☼	○	☼	Ground
14	Alternator Fault	○	○	☼	☼	☼	○	Ground
15	Aux 2 Switch Fault	○	○	☼	☼	☼	☼	Ground
16	Aux 1 Switch Fault	○	☼	○	○	○	○	Ground
17	Oil PSI Switch Shutdown	○	☼	○	○	○	☼	Enabled
18	Alternator Shutdown	○	☼	○	○	☼	○	Enabled
19	Aux 2 Switch Shutdown	○	☼	○	○	☼	☼	Enabled
20	Aux 1 Switch Shutdown	○	☼	○	☼	○	○	Enabled
21	Temp Switch Shutdown	○	☼	○	☼	○	☼	Enabled
22	Programming End	○	☼	○	☼	☼	○	

Legend

LED off	○
LED Blinking	☼
LED on	●

Numeric Values

No.	Value (binary)					
	Preheat LED (Amber)	Aux LED (Red)	Temp LED (Red)	Oil LED (Red)	D+ LED (Red)	OK LED (Green)
0	○	○	○	○	○	○
1	○	○	○	○	○	●
2	○	○	○	○	●	○
3	○	○	○	○	●	●
4	○	○	○	●	○	○
5	○	○	○	●	○	●
6	○	○	○	●	●	○
7	○	○	○	●	●	●
8	○	○	●	○	○	○
9	○	○	●	○	○	●
10	○	○	●	○	●	○
11	○	○	●	○	●	●
12	○	○	●	●	○	○
13	○	○	●	●	○	●
14	○	○	●	●	●	○
15	○	○	●	●	●	●

No.	Value (binary)					
	Preheat LED (Amber)	Aux LED (Red)	Temp LED (Red)	Oil LED (Red)	D+ LED (Red)	OK LED (Green)
16	○	●	○	○	○	○
17	○	●	○	○	○	●
18	○	●	○	○	●	○
19	○	●	○	○	●	●
20	○	●	○	●	○	○
21	○	●	○	●	○	●
22	○	●	○	●	●	○
23	○	●	○	●	●	●
24	○	●	●	○	○	○
25	○	●	●	○	○	●
26	○	●	●	○	●	○
27	○	●	●	○	●	●
28	○	●	●	●	○	○
29	○	●	●	●	○	●
30	○	●	●	●	●	○
31	○	●	●	●	●	●

Legend

LED off	○
LED Blinking	☼
LED on	●

Frequency Calculation Formula

Programming starter protection and overspeed RPM requires determining the corresponding frequency (in hertz) on the tachometer input. The tachometer is typically driven by the frequency tap from the alternator. To determine the appropriate frequency use the following formula:

$$Frequncy = \frac{Poles \times RPM \times \left(\frac{CrankDia}{AlternatorDia} \right)}{60}$$

In this formula,

Poles is the number of alternator pole pairs (typically 6)
RPM is the desired RPM
CrankDia is the crankshaft belt pulley diameter
AlternatorDia is the alternator belt pulley diameter

When the tachometer is driven by a proximity switch, use the following formula:

$$Frequncy = \frac{Pulses \times RPM}{60}$$

In this formula,

Pulses is the number of pulses per revolution
RPM is the desired RPM

When using either formula, round up the frequency to next highest multiple of 10.

Parameter Definitions

Solenoid Function

Indicated by the *Preheat LED* where:

Preheat LED on = Energize to Run (ETR) **(Factory default)**
Preheat LED off = Energize to Stop (ETS)

Overspeed Monitoring

Indicated by the *Preheat LED* where:

Preheat LED on = Overspeed Monitoring enabled
Preheat LED off= Overspeed Monitoring disabled **(Factory default)**

Preheat time – 10s

The 10s of the preheat time where

Preheat time = indicated value times 10 seconds **(Factory default=0)**

For example, for 37 seconds of preheat, the 10s value should be '3' indicated by the *OK* and *D+* LEDs illuminated. See the *Numeric Values* table to determine the LED pattern for a particular value.

Note

Preheat duration can not exceed 120 seconds!

Preheat time – 1s

The 1s of the preheat time where

Preheat time = indicated value in seconds (Factory default=0)

For example, for 37 seconds of preheat, the 1s value should be '7' indicated by the *OK*, *D+* and *Oil* LEDs illuminated. See the *Numeric Values* table to determine the LED pattern for a particular value.

Note

Some software versions have bugs which prevents resetting the preheat time to zero. Contact LOFA Industries for help resolving this issue.

Start Frequency – 1000s

The 1000s of the start frequency in hertz (cycles per second) where

Start frequency = indicated value times 1000 hertz (Factory default=0)

See the *Frequency Calculation Formula* to determine the frequency for a particular RPM. See the *Numeric Values* table to determine the LED pattern for a particular value.

Note

Start frequency can not be programmed greater than 1990 hertz!

Start Frequency – 100s

The 100s of the start frequency in hertz (cycles per second) where

Start frequency = indicated value times 100 hertz (Factory default=2)

See the *Frequency Calculation Formula* to determine the frequency for a particular RPM. See the *Numeric Values* table to determine the LED pattern for a particular value.

Start Frequency – 10s:

The 10s of the start frequency in hertz (cycles per second) where

Start frequency = indicated value times 10 hertz (Factory default=0)

See the *Frequency Calculation Formula* to determine the frequency for a particular RPM. See the *Numeric Values* table to determine the LED pattern for a particular value.

Overspeed Frequency – 1000s

The 1000s of the overspeed frequency in hertz (cycles per second) where

Overspeed frequency = indicated value times 1000 hertz (Factory default=0)

See the *Frequency Calculation Formula* to determine the frequency for a particular RPM. See the *Numeric Values* table to determine the LED pattern for a particular value.

Note

Overspeed frequency can not be programmed greater than 1990 hertz!

Overspeed Frequency – 100s

The 100s of the overspeed frequency in hertz (cycles per second) where

Overspeed frequency = indicated value times 100 hertz **(Factory default=0)**

See the *Frequency Calculation Formula* to determine the frequency for a particular RPM. See the *Numeric Values* table to determine the LED pattern for a particular value.

Overspeed Frequency – 10s

The 10s of the overspeed frequency in hertz (cycles per second) where

Overspeed frequency = indicated value times 10 hertz **(Factory default=0)**

See the *Frequency Calculation Formula* to determine the frequency for a particular RPM. See the *Numeric Values* table to determine the LED pattern for a particular value.

Note

Some software versions have bugs which prevents resetting the overspeed frequency to zero. Contact LOFA Industries for help resolving this issue.

Temperature Switch / Sensor

Indicated by the *Preheat LED* where:

Preheat LED on = Temperature switch **(Factory default)**
Preheat LED off = Temperature sensor (PT1000)

PT1000 enables temperature dependent preheat where preheat is inactive until the temperature falls below 32° F (0° C).

Temp Switch Fault

Indicated by the *Preheat LED* where:

Preheat LED on = Ground is fault **(Factory default)**
Preheat LED off = Open is fault

Oil PSI Switch Fault

Indicated by the *Preheat LED* where:

Preheat LED on = Ground is fault **(Factory default)**
Preheat LED off = Open is fault

Alternator Fault

Indicated by the *Preheat LED* where:

Preheat LED on = Ground is fault **(Factory default)**
Preheat LED off = Battery is fault

Aux 2 Switch Fault

Indicated by the *Preheat LED* where:

Preheat LED on = Ground is fault (Factory default)
Preheat LED off = Open is fault

Aux 1 Switch Fault

Indicated by the *Preheat LED* where:

Preheat LED on = Ground is fault (Factory default)
Preheat LED off = Open is fault

Oil PSI Switch Shutdown

Indicated by the *Preheat LED* where:

Preheat LED on = Ground is fault (Factory default)
Preheat LED off = Open is fault

Alternator Shutdown

Indicated by the *Preheat LED* where:

Preheat LED on = Shutdown enabled (Factory default)
Preheat LED off= Shutdown disabled

Aux 2 Switch Shutdown

Indicated by the *Preheat LED* where:

Preheat LED on = Shutdown enabled (Factory default)
Preheat LED off= Shutdown disabled

Aux 1 Switch Shutdown

Indicated by the *Preheat LED* where:

Preheat LED on = Shutdown enabled (Factory default)
Preheat LED off= Shutdown disabled

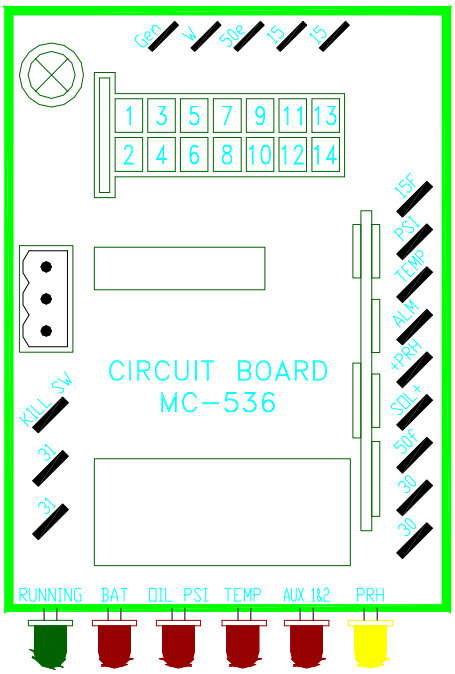
Temp Switch Shutdown

Indicated by the *Preheat LED* where:

Preheat LED on = Shutdown enabled (Factory default)
Preheat LED off= Shutdown disabled

Programming End

After the *Set* button is pressed power must be removed before normal operation is possible. On the next power cycle the new values are active. To exit programming mode without storing the values, *External Stop* must be activated.



Junior Power Timer Pinout (JPT)

Pin	Function
1	D+
3	Aux Switch 1
5	Aux Switch 2
7	Ground (31)
9	Accessory Out (15a)
11	Preheat (VG)
13	Pressure Gauge

Pin	Function
2	Tachometer (W)
4	Temp Sensor/Switch
6	Pressure Switch
8	Solenoid Ground
10	Accessory Out (15a)
12	Solenoid (Mag)
14	Temp Gauge

Power

- Battery+ (30) – 12 or 24VDC
- Ground (31)

Outputs

All outputs are short circuit protected.

- Starter (50f) - 70A
- Solenoid (Mag) - 20A
- Preheat (VG) – 20A
- Alarm (Sig) – 3.5A, active after shutdown
- Accessory (15a) – 20A (active with 15 input)

Inputs

- Accessory (15)
- Start control (50e)
- Temp Sensor/Switch – With PT1000 temperature sensor attached, preheat if temperatures less than 32°F (0°C). With a temperature sensor, the high temperature shutdown occurs at 230°F (110°C).
- Oil Pressure Switch
- Aux Switch 1
- Aux Switch 2
- Tachometer (W) – For starter protection and overspeed monitoring. Pass-through to drive tachometer.
- Alternator excitation/charge indication (D+)
- External Stop (Kill Sw)

Warning

LOFA Industries, Inc. does not recommend using the external stop for emergency stop (E-Stop). The recommended solution is a NC (normally closed) switch wired in series in the solenoid output wire.

Initial Release:	Translated from German, added board drawing.
Revision A: 8-Aug-2005	Corrected programming for Aux Switch 1 and 2. (Parameters were reversed.) Clarified text. Updated charts to better show LED states.
Revision B: 22-May-2006	Added calculation for frequency and changed formatting. Removed section on operation with pushbuttons.
Revision C: 2-May-2007	Corrected light pattern for seven in *Numeric Values* table, added notes on software bugs. Added part number.

Important Safety Information

The warnings in this publication are not all inclusive.

LOFA Industries cannot anticipate every potential hazard.

Appropriate safety rules and precautions should be followed with any tool, work method or operating procedure.

Improper procedures, tools and materials may cause damage or make the equipment unsafe to operate.

Only persons with appropriate training, skills and tools should perform these functions.

Improper operation, maintenance or repair of this product can be dangerous and may result in injury or death.

Do not operate or perform any maintenance or repair on this product until all operation, maintenance and repair information is read and understood.

The information, specifications, and illustrations in this publication are based on information available at the time of publication.

All items are subject to change at any time without notice.

Software License Agreement

This LICENSE AGREEMENT ("Agreement") is made as of the Effective Date noted below by and between **LOFA™ Industries Inc.** ("LOFA"), a Georgia corporation with a principal place of business at 250 Hembree Park Drive, Suite 122, Roswell GA 30076, and Licensee as defined below.

Standard Terms and Conditions

1. **Definitions.** In this Agreement, unless the context otherwise requires, the following terms shall have the following meanings:
   (a) **Agreement** shall mean this agreement (as such may be amended from time to time in accordance with the provisions hereof), information sheets and any exhibits, attachments or schedules referenced herein.
   (b) **LOFA Notices** shall mean all proprietary trademark, patent and copyright notices present in the Materials.
   (c) **Effective Date** shall mean the date Licensee purchases LOFA hardware and/or software.
   (d) **Host Device** shall mean the product or device that hosts LOFA software.
   (e) **New Releases** means material improvements or changes to the LOFA Software that may enhance operating performance. A New Release is signified by an increase in the release number to the left of the first decimal.
   (f) **Information Sheets** shall mean the attached exhibits which contain specific license terms.
   (g) **LOFA Software** shall mean a hardware and/or software item listed in ***Exhibit B – Products/Deliverables***.
   (h) **Licensee Device** shall mean the specific LOFA hardware created by or for Licensee combining the LOFA software with the Host Device as identified in ***Exhibit A***.
   (i) **Materials** shall mean all hardware and/or software products and special documentation listed in ***Exhibit B – Products/Deliverables***, as well as any standard documentation distributed along with such products.
   (j) **Runtime** means those portions of the Licensed Products specifically designated as 'runtime' including libraries and sample code.
   (k) **End User** shall mean the end user of the Licensee Devices.
   (l) **New Releases and Updates** LOFA may, in its sole discretion, develop any New Releases to LOFA Software; however, LOFA has no obligation to develop, sell, or support New Releases.

Acceptance of Terms of this Agreement

In order to use the LOFA software referenced herein, you must first agree to the provisions of this Agreement. Use of LOFA software is prohibited without acceptance of all the terms in the Agreement.

2. **License.**

   Subject to applicable government export regulations, LOFA grants Licensee a world-wide, non-exclusive, non-transferable, perpetual license subject to limitations as defined below to use, LOFA Software solely for use in the Licensee Device. No such Licensee Devices(s) incorporating any of the Materials may be distributed, licensed, sold, rented, or otherwise provided to third parties without the express written permission by LOFA.

3. **License Restrictions and Conditions.** Licensee agrees to the following:
   (a) No distribution of licensee devices incorporating the materials without express written permission.
   (b) This license is restricted to use with up to one (1) specific identified Licensee Devices; additional devices or products from Licensee require additional licenses.

4. **Ownership, Trade Secrets, Protection.**
   (a) All title and ownership in and to the LOFA Software, LOFA trademarks, and the LOFA-supplied portions of items contained in this Agreement, including all intellectual property rights such as copyright, trade secrets, patents, trade-marks and service marks, shall at all times remain with LOFA and its licensors as appropriate. Should Licensee offer any warranties to third parties on behalf of the Licensee Devices, Licensee must be solely responsible for these warranties.
   (b) Licensee agrees that the techniques, algorithms, ideas, concepts, code, and processes contained in the Materials constitute LOFA's trade secrets and are subject to confidentiality protection. As such, Licensee agrees not to reverse engineer, disassemble or decompile, or otherwise attempt to derive the source code for, or perform cryptographic analysis upon, any Licensed Products to the extent this restriction is permitted by law. To the extent the following prohibition is permitted by law, Licensee is prohibited from creating any Licensee Devices which gives third party proprietary software direct access to any of the following items within the Licensed Products: (i) supported API(s); (ii) security and authentication functionalities; or, (iii) any undocumented internal functionality.

      Licensee agrees to take all reasonable measures to keep confidential the Materials, and protect LOFA's (and its licensor's) rights in the Materials (including, for purposes of this Section, additional hardware, software or information provided. Licensee agrees not to disclose the confidential portions of the Materials to anyone, or copy them, except as permitted under this Agreement.

   (c) Customization of a customer facing page does not grant ownership rights of software

      As used in this Section, the phrase "confidential portions of the Materials" specifically does not include the Runtime elements solely to the extent that such elements are distributed in accordance with this Agreement.

5. **Compliance with Laws.** Licensee must comply with all applicable export, import, or other relevant laws of any applicable jurisdiction. Determination of the applicable law is Licensee's responsibility. Licensee understands that the Licensed Product is cryptographic in nature and therefore the Materials are highly regulated. Licensee is strictly prohibited from exporting, re-exporting or importing the Materials (after initial delivery by LOFA to Licensee), regardless of method (including, for example and not by limitation by use of physical delivery, e-mail, or download from FTP or website, etc.), without first complying with all applicable government use, import, or export laws, rules, regulations, orders, and obtaining any necessary approvals or permits. Obtaining any necessary export or import approval for Licensee Devices and/or the Materials (after initial delivery of the Materials by LOFA to Licensee) is the sole responsibility of Licensee.

6. **Fees.** Licensee fees are referenced in the Purchase Order.

7. **Limited Warranty.** LOFA warrants for a period of thirty (30) days from the first date that it delivers to Licensee the Materials that (a) the Licensed Product(s) will operate in conformity with the material specifications for such item; (b) will be free from material defects; and (c) the media, if any, on which the Licensed Product is furnished will be free from material defects in materials and faulty workmanship under normal use. LOFA's sole liability and Licensee's exclusive remedy for any failure to meet these warranties will be limited to repair or replacement of the defective Materials at LOFA's option and expense.

8. **Warranty Disclaimer.** Except as provided in this Agreement, LOFA transfers the Materials to Licensee on an "as is" basis. The warranties in this Agreement, are in lieu of all other warranties or conditions, and LOFA makes no other warranty, condition or representation of any kind whether express or implied, and LOFA expressly disclaims the implied warranties or conditions of merchantability, merchantable quality, fitness for a particular purpose, infringement and those arising by statute or otherwise in law or from the course of dealing or usage of trade. LOFA does not represent or warrant that the Materials will meet any or all of Licensee's particular requirements, that the operation of the Materials will be error-free or uninterrupted, or that all programming errors in the Licensed Product can be found in order to be corrected. All warranties provided in this Agreement are solely for the benefit of, and may not be transferred by, Licensee, to any third party.
   (a) Limits on Scope of Indemnity. LOFA will have no liability for any infringement arising from (i) the use of the Licensed Product other than as set forth in its accompanying documentation or specifications; (ii) the modification of the Licensed Product; or (iii) the combination or use of the

Licensed Product with other software, hardware, items or processes to the extent such infringement is not foreseeable use of the Licensed Product. This Section states LOFA's entire obligation with respect to any claim regarding the intellectual property rights of any third party.

(b) Licensee Indemnification Obligation. Licensee shall indemnify, defend and hold harmless LOFA, its directors, officers, and employees from and against any claim, demand, cause of action, loss, damage, liability suit, proceeding, judgment, or cost (including attorney fees), brought against LOFA which is based on the creation, use or distribution of Licensee Devices to the extent that such suit or proceeding does not arise or result from: (i) LOFA's material breach of any agreement, obligation, representation, warranty or covenant contained in this Agreement; (ii) any wrongful, negligent action or failure to act by LOFA, its employees, agents or independent contractors; or, (iii) any liability for which LOFA is obligated to indemnify Licensee under this Section.

9. **Term and Termination.**

(a) Term. Unless otherwise specified in Exhibit A, the term of this Agreement will commence on the Effective Date and will continue into perpetuity unless otherwise terminated earlier under this Agreement.

(b) Termination for Cause. Any of the following shall suffice to terminate this Agreement:

(i) If Licensee materially breaches any term or condition of this Agreement and fails to cure that breach within thirty (30) days after receiving written notice of the breach.

(ii) This Agreement will terminate automatically without notice and without further action by LOFA in the event Licensee becomes insolvent (i.e., becomes unable to pay its debts in the ordinary course of business as they come due), makes an assignment in violation of this Agreement or makes an assignment for the benefit of creditors or if any other bankruptcy proceedings are commenced by or against Licensee.

(c) Consequences. Upon the termination of this Agreement for any reason: (i) all rights granted hereunder will automatically revert to LOFA; (ii) Licensee must (A) return to LOFA (or, at LOFA's option, destroy) the originals and all copies of the Materials in Licensee's possession or control; (B) erase any and all of the foregoing from all computer memories and stored Licensee Devices within its possession or control; and (C) provide LOFA with a written statement certifying that it has complied with the foregoing obligations. End use licenses to Licensee Devices for Customers granted by Licensee to Customers prior to termination will survive any such termination.

10. **Limitation of Liability.**

(a) LICENSEE AGREES THAT ANY LIABILITY ON THE PART OF LOFA FOR BREACH OF THE WARRANTIES CONTAINED HEREIN OR ANY OF THE OTHER PROVISIONS OF THIS AGREEMENT OR ANY OTHER BREACH GIVING RISE TO LIABILITY OR IN ANY OTHER WAY ARISING OUT OF OR RELATED TO THIS AGREEMENT FOR ANY CAUSE OF ACTION WHATSOEVER AND REGARDLESS OF THE FORM OF ACTION (INCLUDING BREACH OF CONTRACT, STRICT LIABILITY, TORT INCLUDING NEGLIGENCE OR ANY OTHER LEGAL OR EQUITABLE THEORY), WILL BE LIMITED TO LICENSEE'S DIRECT DAMAGES IN AN AMOUNT NOT TO EXCEED THE TOTAL AMOUNT PAID TO LOFA BY LICENSEE FOR THE LOFA HARDWARE.

(b) LICENSEE AGREE THAT IN NO EVENT WILL LOFA BE LIABLE FOR DAMAGES IN RESPECT OF INCIDENTAL, ORDINARY, PUNITIVE, EXEMPLARY, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES EVEN IF LOFA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES INCLUDING, BUT NOT LIMITED TO, BUSINESS INTERRUPTION, LOST BUSINESS REVENUE, LOST PROFITS, FAILURE TO REALIZE EXPECTED SAVINGS, ECONOMIC LOSS, LOSS OF DATA, LOSS OF BUSINESS OPPORTUNITY OR ANY CLAIM AGAINST LICENSEE BY ANY OTHER PARTY.

(c) LICENSEE ACKNOWLEDGES THAT LOFA'S LIMITED LIABILITY EXPRESSED IN THIS AGREEMENT REPRESENTS A MATERIAL BASIS FOR SETTING THE FEES FOR LOFA HARDWARE.

11. **Use of Trademarks.**

Any and all trademarks and trade names which LOFA uses in connection with the license granted hereunder ("LOFA Marks") are and remain the exclusive property of LOFA. Nothing contained in this Agreement may be deemed to give Licensee any right, title or interest in any LOFA Marks. Subject to notice from LOFA in writing which modifies or cancels such license at LOFA's sole discretion, during the continuance of this Agreement, LOFA hereby grants Licensee a nonexclusive, revocable license to the LOFA Marks for normal advertising, marketing and promotion of Licensee Devices according to guidelines that LOFA may issue from time to time. Licensee must act consistently with LOFA's ownership of the LOFA Marks and may not use LOFA Marks in a disparaging manner. Licensee agrees to use correct trademark notices on advertisements, sales literature, dealer materials, press releases and other marketing materials, which use or display LOFA Marks. Licensee agrees to provide samples of all Licensee's marketing materials and Licensee Devices containing LOFA Marks to LOFA for prior approval. If LOFA rejects any of Licensee's use of LOFA Marks, then the parties may cooperate reasonably in order modify such materials for approval prior to release or use by Licensee. To the extent that LOFA withdraws any portion of the trademark license granted in this subsection, Licensee's obligations under this Section, above, will also terminate if the rights necessary to comply with such obligation are withdrawn.

12. **Interpretation of This Agreement.** This Agreement is the entire Agreement to date between the parties regarding the Materials and supersedes any such prior agreement or communication. Any subsequent waiver or modification of this Agreement, or any part, shall only be effective if reduced to writing and signed by both parties. No delay or failure to enforce any right under this Agreement will be considered a waiver of a party's rights thereafter to enforce each and every right and provision of this Agreement. If any provision of this Agreement is declared by a court of competent jurisdiction to be invalid, illegal, or unenforceable, such provision will be severed from this Agreement and the other provisions will remain in full force and effect. This Agreement will be binding upon, and inure to the benefit of, the successors, heirs and assigns of the parties. Neither Licensee nor Licensee employees, consultants, contractors or agents are agents, employees or joint-venturers of LOFA, nor do they have any authority to bind LOFA by contract or otherwise to any obligation. Licensee agrees not to make any statements that state or imply that LOFA certifies or guarantees Licensee Devices or that Licensee Devices are warranted, tested or approved by LOFA. Dates and times by which either party is required to render performance will be postponed automatically to the extent and for the period of time that such party is prevented from meeting them by reason of any cause beyond its reasonable control. Unless otherwise specifically expressed in this Agreement, the specific business terms and negotiated customisations to this Agreement will be considered confidential ("Business Terms"), and neither party my disclose such information to third parties except as follows: (a) to employees, advisors, financing parties or contractors who are under an obligation of confidentiality to the extent reasonably necessary to conduct business; (b) to the extent that such Business Terms become publicly known through no fault of the parties; (c) to the extent required to comply with any valid law, regulation, statute, or order so long as the non-disclosing party receives reasonable advance notice of such potential disclosure; and (d) to the extent required to enforce, establish, or interpret any right or duty at law or equity with respect to this Agreement.

13. **General.**

(a) All notices hereunder will be in writing and must be duly given if delivered personally or sent by registered or certified mail, return receipt requested, postage prepaid, to the respective addresses of the parties appearing in this Agreement. Any notice given will be deemed to be received: (i) on the date which it is delivered if delivered personally, (ii) or, if mailed, on the fifth business day next following the mailing thereof. Either party may change its address for notices by giving notice of such change as required in this clause.

(b) This Agreement, the license rights granted hereunder and the Materials, or any part thereof, may not be assigned or transferred by Licensee, including by operation of law ("Transfer"), without the prior written consent of LOFA. Any such transfer without the prior written consent of LOFA will be ineffective. In any case, any such Transfer absent LOFA's written permission will immediately and automatically terminate this Agreement without further action by LOFA. A change of control of Licensee, whether by sale or issuance of shares (except in the ordinary course of raising capital by public offering), or merger, or otherwise, will be deemed to be an assignment.

(c) The laws in force in the State of Georgia will govern this Agreement; the parties hereby consent to jurisdiction and venue in the courts of Georgia.

(d) The provisions in Sections - Licensee's Indemnification, - Ownership, Protection, –Fees - Limited Warranty, - Warranty Disclaimer, - Indemnification, -Term and Termination, Limitation of Liability, - Interpretation of Agreement, and -General (inclusive), remain in force and effect after the termination of this Agreement.

Special License Terms

THE LICENSE GRANTED HEREUNDER IS RESTRICTED SOLELY TO THE OPERATION OF THE LOFA HARDWARE AND FOR NO OTHER PURPOSE. NO SUCH LICENSEE DEVICE INCORPORATING ANY OF THE MATERIALS MAY BE DISTRIBUTED, LICENSED, SOLD, RENTED, OR OTHERWISE PROVIDED TO THIRD PARTIES WITHOUT LOFA'S EXPRESS WRITTEN PERMISSION.

Exhibit A

Licensee Information not required

Exhibit B – PRODUCTS/DELIVERABLES

Licensed Product Information

Software codes with product numeric prefixes of 001 through 009 inclusive.

Software codes qualified under the same numeric regimen detailed above or including the verbal description of "CANplus™" products and/or the "CANplus Suite" of products.

Maintenance and Technical

Platform Requirements

.NET Framework 3.5

Windows® XP, Windows Vista (32/64-bit), Windows 7 (32/64-bit)