

LCC300A LOCOMOTIVE SPEED CONTROL

PRODUCT
INFORMATION
BULLETIN

PIB1094

MAY 1997

INTRODUCTION

The LCC300A Locomotive Speed Control integrates the functions of several modules into one speed control system for direct drive locomotives not requiring excitation controls or other special applications. The LCC300A is a wide range variable engine speed control that includes speed ramping and a two element speed switch.

The engine speed control is a high performance, isochronous or droop, closed loop speed control system similar to GAC's latest ESD Series of speed control units. The speed input is typically from a magnetic pick-up that measures flywheel speed. The output of the LCC300A electrically drives a Cummins EFC actuator, a fuel metering actuator such as the ADB120E4 from GAC, or one of the other GAC proportional actuators.

DESCRIPTION

SPEED SELECTION

Operating speed is selected through either the 0 - 10V DC or 0 - 20MA control signal typically used in locomotives.

The speed range requested by the control signal is adjustable (MIN and MAX). Adjust the MIN speed when the input signal is 0V or 0ma. Adjust the MAX speed when the input signal is at its maximum.

GOVERNOR PERFORMANCE ADJUSTMENT

Governor performance can be optimized with the PID adjustments. The GAIN (P), STABILITY (I), and DEAD TIME (D) are adjustable with potentiometers or switches. The OPTION switches allow gain reduction and dead time compensation adjustment.

SPEED RAMPING

An internal speed ramping circuit has adjustments to control engine acceleration and deceleration rates. These adjustments are provided to insure smooth speed transitions when the speed control signal is changed.

CRANK TERMINATION

A crank termination speed switch with relay contacts is also provided to operate the starter motor. The multi-turn adjustment sets the point of cranking motor cut out. The green LED indicates that cranking has been terminated. The crank termination relay automatically resets after a decrease of 550 Hz from its setting. The standard specification for the LCC300A is to trip at 450 Hz.

OVERSPEED SENSING

The independent overspeed sensing circuit has relay contacts to operate a fuel or air shut off valve. The trip point is adjustable with a multi-turn potentiometer. This relay latches once it has been tripped. TEST and RESET switches are provided. When the TEST switch is pressed, the overspeed set point is lowered by 25%. The red overspeed LED indicates the status of this function.

STARTING FUEL CONTROL

Engine starting fuel is controlled by the proprietary GAC starting strategy. The optimum adjustment will greatly reduce excess exhaust smoke during engine starting. START FUEL ADJUST and START FUEL RAMP time adjustments are provided.

Additional features of the LCC300A are: Over Voltage Protection, Reverse Voltage Protection, Actuator Short Circuit Protection, and an internal EMI filter for the battery supply.

INSTALLATION

Refer to the Wiring Diagram for proper connections. It is recommended that the magnetic pick-up cable be shielded to Terminal B as shown. It is also recommended that the actuator cable be shielded with its shield connected to Terminal D.

When mounting the LCC300A, attach it to a vertical surface to prevent any moisture from collecting on the circuit board. If vibration is a concern, mount the unit on soft vibration isolators.

CONTROL FUNCTION DESCRIPTION

GAIN

Clockwise adjustment (100) increases the sensitivity of the governor speed control loop. The range is 30:1. (See OPTION switch for additional gain reduction.)

STABILITY

Clockwise adjustment (100) shortens the response time of the governor control loop. The range is 25:1.

DROOP

Clockwise adjustment (100) will add droop to the speed control system. A full CCW (0) adjustment selects the isochronous mode of operation. Droop is proportional the actuator operating current range.

ACCELERATION

A clockwise (100) adjustment will allow the engine speed to increase at a faster rate. Full CCW (0) is the slowest acceleration, approximately 200 Hz/sec.

DECELERATION

A clockwise (100) adjustment will cause the engine to decelerate more quickly. Full CCW (0) is the slowest deceleration, approximately 200 Hz/sec. Engine inertia and load may limit the maximum closed throttle deceleration rate. Do not exceed this setting or a delay may occur on reacceleration.

The MIN speed range is 400 – 2900 Hz. The MAX speed range is 200 Hz above the MIN speed setting up to 6000 Hz.

The 0 – 10V control signal is common to the minus battery supply (Terminal 2). It is suggested that this control signal be an isolated voltage source.

The 0 – 20ma control signal is common to the minus battery supply (Terminal 2). It is suggested that this control signal be an isolated current source.

SPECIFICATIONS

Speed Range	MIN = 400 – 2900 Hz
	MAX = MIN + 6000 Hz
DC Input voltage.....	20 - 32 Volts DC (Nominal 24V DC)
	Transient and reverse voltage protected to 200V DC
Magnetic pick-up input.....	0.5 - 50V AC
Actuator Current.....	up to 10 Amps
Input Impedance	Terminals I & 2 = 9K Ω
	Terminals K & 2 = 300 Ω
Speed Droop (300 Hz for 1A change).....	0 - 5% based on actuator current change of 2.5 Amps
Acceleration.....	200 - 1500 Hz/sec 0.8 - 12 sec
Deceleration.....	200 - 1500 Hz/sec 0.8 - 12 sec
	may be limited by closed throttle engine deceleration
Speed Switches	
Overspeed Range.....	2000 - 8000 Hz
Crank Termination Range.....	200 - 1900 Hz
Relay Contact Ratings	10 Amps
Operating Temperature	- 40°C to 80°C
Humidity.....	up to 95%
Vibration.....	per IEC#77
Shock	10g, 11msec

WIRING DIAGRAM

