



## Overview

The LLC™ software module is engineered specifically for controlling leveler and straightener applications requiring loop control. The program is embedded within the controller of a UNICO drive, eliminating the need for an external control rack. When used in conjunction with a programmable controller, the drive forms a powerful automation work cell that can either stand alone or be easily integrated with other UNICO automation cells to build a complete control system for a metal-processing line. Embedded control reduces system complexity while taking full advantage of the exceptional performance, flexibility, and ease of use of UNICO drives.

## Features **Loop Regulation**

The loop control regulates loop depth by controlling the speed of a motor, such as a leveler or straightener, at the entry side of a pit. Two loop modes are provided. *Loop fill* mode maintains the loop at a prescribed depth, filling it whenever material is removed. This mode is typically entered following thread-up to keep the loop filled while jogging or single-feeding prior to entering line run. *Automatic loop* mode runs the loop drive at a nearly constant velocity, varying its speed only as necessary to keep the loop within the desired operating range. Zone limiting provides the ability to keep the loop within a specific loop zone in cases where material slippage is a concern.

## **Material In/Out Control**

Precise loop regulation is achieved using encoders on the entry and exit sides of the loop to directly measure the amount of material entering and leaving the pit. Normally, these feedback devices would be a leveler or straightener motor pulse generator and a feeder motor pulse generator. The calculation is referenced to the loop eyes to compensate for any error introduced by material slippage. Continuous monitoring of loop material minimizes variations in the speed of the looping drive and helps to eliminate loop violence, roll marks, catenary slapping, and scratching. It also makes it easier for the uncoiler to maintain consistent backtension.

## **Creep Mode**

An automatic creep mode keeps the drive running at a very slow speed whenever the line is stopped but remains in automatic. This prevents damaging the material with roll marks that result from stopping and starting a leveler or straightener. If the line is restarted before the loop reaches bottom, the loop will resume its previous mode. The motor stops when the material reaches the full-loop light.



LLC™

Embedded  
Loop/Leveler  
Control

**Features**    **Loop Eye Support**

*(continued)*

The control supports digital inputs for up to four loop eyes for monitoring and controlling the depth of the loop. The eyes provide an absolute reference as to the amount of material stored in the pit when an eye is crossed. An automatic referencing feature simplifies setup of the eyes by determining the loop storage at each. The loop eyes also guard against tight- and full-loop conditions.

**Sonic or Laser Loop-Depth Feedback**

An external device, such as a sonic or laser sensor, can alternately be used in place of the middle loop eyes to directly measure loop depth. Feedback is supplied as an analog input that can be filtered to remove any noise or disturbance in the signal.

**Loop Table Provision**

Loop referencing can be disabled during line thread-up or tailout to prevent the loop table of the leveler or straightener from interfering with the loop eyes or external loop-depth feedback device.

**Programmability**

The control can be customized to a specific installation using *UEdit™*, a powerful Windows-based programming tool that lets users add their own ladder logic and function-block programming.

**Inputs/  
Outputs**

A variety of input/output functions are provided for integrating the loop/leveler control with external devices. The user can select the functions required by a given system and specify their corresponding hardware or serial I/O points.

**Inputs**

- motor on
- fault reset
- jog forward
- jog reverse
- fast stop
- motion enable
- auto
- auto fill
- auto run
- loop depth reset
- loop reference disable
- tight loop
- upper middle reference
- lower middle reference
- full loop
- velocity feedforward select 0
- velocity feedforward select 1
- velocity feedforward select 2

**Outputs**

- motor on
- no fault
- manual
- auto
- in motion
- forward motion
- reverse motion
- at zero velocity
- at request velocity
- at maximum velocity
- tight loop
- full loop
- fill depth
- loop referenced
- loop in limits

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