

**“COORDINATOR” Tensioner and Dr. Blade
Programming Software User’s Manual**

“Every Thing For Filament Winding”

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To our customer: this manual contains confidential technical information on McClean Anderson Coordinator software. You are not allowed to disclose the contents of the manual to other parties without McClean Anderson's permission.

1.Introduction

Coordinator is a visual programming tool for McClean Anderson Digital Tensioner and Dr. Blade. You can use 15 conditions to program our Digital Tensioner or Dr. Blade and make the tension or opening coordinate with your winding program. The 15 conditions include 6 position conditions and 6 velocity conditions for Mandrel, Carriage, Elevation, Cross-feed, Yaw and Eye rotation, Circuit number, Segment number of your winding program(mmt or chain file) and Process time. With such capabilities, you can expect a better quality control for your filament wound products. Such an programming and coordinating technology are not restricted by tensioner or Dr. blade only, the philosophy and technology can enable numerous device to coordinate with filament winder and limitation is just your imagination. You can tell us what else you want utilize this technology for coordinating with your filament winder, and we will do our best to make that happens.

Visual programming means you do not need to type in a bunch of codes into the computer like some computer languages do, for example Basic or C. Instead, you just need move and click your mouse, and some numerical values to predefined dialog input box and Coordinator will display a program tree to you. The program will be organized with a hierarchy structure like a tree to facilitate checking or understanding. You can unfold and fold the nodes of the programming tree by clicking junction box of the branches. When the program increases, a vertical or horizontal scroll bar will be appear depending on the growing direction of the program. You can click or drag the scroll bar to navigate the whole view of the tree. If you like, you can discard node names suggested by the software and type another name that you think it is better to represent the contents of the node.

The design philosophy behind Coordinator is to simplify the operations as much as possible. So instead of navigating between menus and dialog box, we designed one screen user interface, which is very straightforward. You need not access menus during the programming session. Everything is on one screen. And the user interface is arranged according to working flow of Coordinator.

2. Terminologies

2.1 Program Type

Right now, Coordinator supports two program types. One for tensioner and one for Dr.Blade. The program type will be recorded in the program tree root in the program tree file, which has an file name extension “.tre”. The binary file of Tensioner program use “.ten” as its program extension name. Whereas, the binary file of Dr. blade use “.bld” as file extension name.

2.2 Units

Coordinator supports English and Metric Units. For Tensioner, tension in metric unit will use Kg and tension in English unit will use pound. Default unit when program starts is English. When you change units, conditions for defining activating zone will be also changed. For example, velocity of linear winder axes will be m/s when metric is selected, it will be FPM(foot/minute) when English is selected. But for rotating axes of winder such as mandrel, yaw or eye rotation velocity will always be RPM. Units changes also applies to position of winder axes. For instance, the position of linear axes such as carriage, elevation, cross-feed will use inch when English units is selected, whereas they will use mm when metric unit is selected. The unit of process time is not affected by the unit selection. It is always be second. Segment and circuit number are values without units.

2.3 Motor ID

Here each servo controlled motor gets a numerical value to use as an ID. The motor could be a tensioner unit/channel or a Dr. Blade unit/channel that could be independently controlled. Please check the valid motor ID range in your control system.

2.4 Group

In the program tree, group is the first level below root, which defines the program type and unit type of program. Group defines all the motors be programmed to use same output value whenever the winder's state is.

2.5 Default Output Value for Group

When the winder is not in the state of Estop (error state) or none of the statements defined in the program asserts true, then all the motors in the group will apply the default value as the output value of tensioner or Dr.Blade.

2.6 Error State Output Value for Group

When the winder is not in the state of Estop (error state), all the motors in the group will apply the error out value as the output value of tensioner or Dr.Blade.

2.7 Statement

A statement defines the logical operator and output value when a group of conditions belong to the statement are evaluated true.

2.8 Output Value for Statement

When the winder is not in the state of Estop (error state), if any of the statements defined in the program asserts true by evaluating all the conditions below statement, then all the motors in the group will apply the statement output value as the output value of tensioner or Dr.Blade.

2.9 Activating Zone

An activating zone is a region where anyone of 15 process conditions values lies within the start and end values of the region boundary. Please note the range for the zone is that the select condition value greater or equal than the start value and less than the end value.

However, when there are several statements defined below a group, and there are more than one statements are evaluated as true, the last statements that is evaluated as true will take effect because its value will overwrite all the previous one. So it is programmer's responsibilities to check the possibilities of overlapped statements and the consequence.

2.10 Logical Operator

You can use one type of logical operator, either AND or OR to combine several activating zones together below one statement. If you use AND, all the ZONES must be evaluated as true to get the statement output value. Whereas if you use OR, either one of all the ZONES defined below the statement is true, then the statement output value will be used to fill the outputs for all the motors in the group.

2.11 Process Condition

There are 15 process conditions to describe the filament winding machine states. The 15 conditions include 6 position conditions and 6 velocity conditions for Mandrel, Carriage, Elevation, Cross-feed, Yaw and Eye rotation, Circuit number, Segment number of your winding program(mmt or chain file) and Process time. If your filament winder does not have elevation, yaw, eye rotation or cross feed installed, then a program generated for any unavailable axes will not work.

3.Quick start

3.1 Basic Steps

There are 5 steps to define a basic program in Coordinator.

- (1) Select program type
- (2) Select Units
- (3) **Define Group:** Type in the default output value for the new group you want add. Type in the error state output value for the new group you want add. Click the “Add New Group” button to add a new group. Define motor ID in the group by clicking the “Add motor ID to group” button or “Add motor ID Range” button. The first button can be used when motor ID in a group is not continuous. The second one is the fastest way to define a continuous motor ID range with fewer operations.
- (4) **Define statement:** after a group is defined, click the group node. It is highlighted and means it is selected. After the group is selected, firstly you type in an output value for the statement you want to add, then you select the “Logical Operator” applies all the “Activating Zone” belongs the statement. Click “Add the Statement to Group” button to add the statement below the current selected group.
- (5) **Define “Activating Zone”** for current statement: firstly select the statement you want add some “Activating Zone” by click the statement with left mouse button. After the statement is highlighted, then click the arrow at the right side of condition lists. The condition list is pulled down. Click the pulled down vertical scroll bar to select the condition you want to choose. After the condition type is selected, then type in the start value and end value for the condition. The three elements: condition type, start value, end value constitute an “Activating Zone”. After “Activating Zone” is defined, click “Add Zone to Statement” button to add the zone below the statement.

If you want add other group, then you have to select program tree root first. If you want add other statement, firstly you have to select the owner group of the statement first by clicking the right group. If you want add more “Activating Zone” to statements, you also firstly select the owner statement of “Activating Zone” by clicking the right statement. The rest steps should follow the specific procedures among the three lettered steps accordingly.

3.2 Other Topics

3.4.1 Start a New program

You can start a New program in three ways. If the program tree is blank, then you can follow the basic steps and create a new program. If the program tree is not blank, you may want to save a program with root, group, statement and activating zone are defined. Otherwise, coordinator will check the integrity of the program and point out what is missing in the program. If you just want abort a program and start a new one, select the root of the current program tree and click Delete Node, then you will delete all the content of the program tree and a blank view. After that, you will be allowed to change the program type and units option.

3.4.2 Edit the Numerical Values

Since Coordinator use reserved key words to parse the program tree, you are not allowed to change anything except the numerical value of the “*.tre” file. You can change the numeric values of the program tree directly by two ways. Firstly, you can open the “*.tre” file with a text editor like Notepad. Secondly, in coordinator program tree view, you can just click the left button of the mouse till the node is opened for its content by watching the cursor shape changes to “I” and then you can start the editing.

Remember do not edit the content except of numerical value, otherwise it could cause problem of Coordinator that it could not parse the program tree and export it as an binary form, which is needed to load to Omniwind.

3.2.2 Export the Binary File

The program tree is a text file used for editing purpose. After editing is done, you need to export the program tree to binary form, which is `*.ten` file for Tensioner or `*.bld` for Dr.Blade. To do that, you need click the "Save Program" button. After the button is pressed, Coordinator will parse the program tree and check the integrity of the tree. If there is no error, then an binary file using the same file name but with different extension name mentioned above will be exported. To use the binary file, firstly copy the file to the directory with your winding program (mmt or chn file), then rename the binary file generated by Coordinator to the same name as your winding program. Here we mean the file name not the extension name.