Parameter 179 is used configured and control a variety of different machine tool lube pumps. The parameter value is formatted as MMMSS: “MMM” for minutes and “SS” for seconds. Below is a table of some examples.

<table>
<thead>
<tr>
<th>Type of Lube Pump</th>
<th>MMM</th>
<th>SS</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical/CAM</td>
<td>0</td>
<td>0</td>
<td>179 = 0 Lube Pump Power is on when machine is running a job or in MDI.</td>
</tr>
<tr>
<td>Direct Controlled Pump</td>
<td>30</td>
<td>15</td>
<td>179 = 3015 Waits for 30 min of job or MDI time, then applies power to run the lube pump for 15 seconds.</td>
</tr>
<tr>
<td>Electronic “Lube First” or “Lube Last” pumps</td>
<td>16</td>
<td>00</td>
<td>179 = 1600 Holds power on to the pump for 16 minutes starting with Cycle Start to run a G-code program or MDI. Holds lube power on for 16 minutes even if job has ended before timer is up. Be sure to set on-board pump timer to 15 minutes.</td>
</tr>
</tbody>
</table>

Rules:
- Maximum Value for MMM = 655 minutes. Maximum Value for SS = 99 seconds.
- When SS seconds is set to zero this changes functionality of the Lube Power to: Always ON for MMM number of minutes specified.

A parameter 179 value of 3015 = Every 30 minutes of accumulated G-code Run Time the lubrication pump will be activated for 15 seconds (by applying power through a relay output found on the Centroid CNC controller). The Centroid CNC12 software “machine running G-code” cumulative timer is only activated when running a G-code program or using MDI mode. This cumulative time is NOT counting the CNC control “on time” when just idling, it only counts time the machine is running a G-code job or in MDI mode. This value should be adjusted as necessary depending on your particular machine as shown in the examples below:

- Mills that run long jobs (>30 minutes) with a lot of slow movements with a direct controlled pump: = 3015.
- Lathes running short jobs with many fast movements with a direct controlled pump: = 1010.
- Mills running many short jobs with a direct controlled pump: = 2015

Mechanical or Cam Operated Lube Pump Description
The Mechanical/Cam operated lube pump is based on a plunger riding on a clock driven cam. The classic Mechanical Bijur Lube pumps and copies of them operate this way. When power is removed the mechanical properties of the pump keep track of the accumulated operating time of the machine, resulting in a very dependable lube operation.
Set Parameter 179=0 (default value) Lube Pump relay is activated when running a G-code program, therefore power is applied to the lube pump when a G-code job is running, or operating in MDI mode.
Direct controlled Pump (ideal)

Direct Controlled Pumps: they have no built in timer, they pump lube oil when powered. When they have power they pump lube oil. So with these units it is up to CNC12 to keep track of the accumulated operational time of the machine and then turn on the pump for a specified amount of time at the end of the accumulated run time. This type of Lube Pump setup also results in very dependable lube operation.

Direct Controlled Pump

Example 1: Set P179 = 3015 and the Lube pump will pump oil to the machine for 15 seconds for every 30 minutes of total accumulated machine run time (as in running a g code job or in MDI mode, not just the CNC controller being ON)

Example 2: To set the lube pump power to come on for 5 seconds every 10 minutes of accumulated machine run time set P179 = 1005.
Electronic Pumps
Problem: Electronic timer pumps "forget" when the Lube pump relay power is off. Therefore, they begin a new timed cycle at every time the lube relay power comes back on. Running short jobs with a “Lube First” pump with typical configuration settings for a Mechanical or Direct controlled pump will result in over lubricating and with a “Lube Last” pump no lubricating can occur. While you could direct wire the Electronic Pump to the CNC control power to come on when the CNC is on, this could result in over lubrication when the machine sits idle. Centroid solves this problem with Parameter 179's hold power function. By setting the minutes in P179 to a value larger than the than the pump on-board timer amount ensures that the machine will receive lube as Centroid holds the Lube Pump relay power ON from the first Cycle Start for (user specified) minutes no matter if a job is running or not. When SS seconds is set to zero this changes functionality of the Lube relay power to always ON for XXX number of minutes specified.

For example. With the Lube Pump on-board timer set to 15 minutes and P179=1600. The Lube Pump power relay is activated and powers the Lube Pump with the first Cycle Start to run G-code, and then the power to the pump stays on for 16 minutes even if the G-code job ends before that time or if another G-code job is started, the power stays on while the timer runs for the specified amount of time. The Lube Pump Power ON relay timer will time-out after 16 minutes (or with Estop). After completion of the 16 minutes of ON time, the Lube relay power ON to the pump timer will restart the next time Cycle Start is used to start a G-code job. While the 16 minute ON timer is running it ignores any Cycle Start events while the timer is running. Estop cancels the timer, Cycle Start to run a G-code job starts it again.

Electronic "Lube First" and “Lube Last” Pumps
The "Lube First" style of pump lubricates at the beginning of each timed cycle. An on-board pump timer sets the time between lube operations, typically set to 15 to 30 minutes
Example: The lube pump on-board timer is set to 15 minutes. Parameter 179 should be set to a minimum of 16 minutes, or 1600, to ensure proper lubrication.

The "Lube Last" style of pump lubricates at the end of each timed cycle. An on-board timer sets the time between lube operations. Uses same settings as a Lube First pump. Example: The lube pump on-board timer is set to 15 to 30 minutes. Parameter 179 should be set to a minimum of 16 minutes, or 1600, to ensure proper lubrication.
Description from the PLC program comments related to Electronic Lube Pump Operation.

"METHOD 1 (SS == 0) For Electronic lube pumps with internal timers.

When using this method, P179 should be set such that MMM is a value that is greater than the cycle time set on the internal timers and SS should be set to zero. How much greater MMM needs to be depends on the accuracy of the lube pump timers, but it is better to be on the long side to ensure proper operation.

Example 1. The internal lube cycle interval is set to 60 minutes.
Set P179 = 7500. In this example, as long as the accuracy of the lube timer interval causes the lube to turn on within 75 minutes, it will work. Note that the amount of time that lube is output is usually set with another timer control on the lube pump and it does not factor into the setting of P179.

It should be noted that lube pumps with internal timers may differ on how they operate.

(a) For pumps that lube immediately when power is applied and then start timing until the next cycle, it is possible to run out of lube quickly on short job runs if, after the program has been run, lube power is removed.

(b) For pumps that do not lube until it has been turned on for the interval time, it is possible that lube never gets applied if, after the short program has been run, lube power is removed and the electronic pump keeps resetting the timer/counter.

A short program or job run is defined as a job that finishes before the interval setting (60 minutes in the above example).

For the above mentioned reasons, we want the power to be applied for at least the amount of time set by the interval timer whether the machine is running a job or not, noting that if the user decides to engage the E-stop to remove power after short jobs, then they risk the above mentioned problems according to the type of pump and the Timer gets reset with each Estop."
Notes:

- As always, when walking away from a machine tool, press Estop. Do not leave the machine in MDI mode for very long periods of time (for example overnight or the weekend) as the lube pump will be activated in such circumstances when the machine hasn’t been moving resulting in over lubrication.

- Acorn users can set P179 using the Acorn CNC12 setup Wizard.

- Acorn users can also assign the Lube Pump relay output to any relay and the Lube pump low oil level switch to any input using the Acorn setup Wizard.
Run the lube pump to oil the machine for the first time or check the pressure.

The on-board lube pump pressure gauge can be used to diagnose several different problems including leaks and blockages by monitoring the max pressure, time to build to max pressure, and the time to bleed off to zero. These values should be recorded when a new machine is installed, and checked on a weekly basis as part of normal routine maintenance. With a Direct Controlled Pump, to measure the max pressure, build time and bleed time. Set parameter 179 to 0.0000. Then press MDI from the main menu. As soon as MDI starts power will be applied to the lube pump and the unit and it will begin to pump (if it is a Direct Controlled pump or begin to run a timer, either Mechanical or Electronic). Some units may have a button to force the pump to run these are typically seen on Electronic Units or other units have a manual plunger to pump oil these are typically seen on Mechanical units. Once max pressure has been reached, press to exit MDI and stop the pump. Be sure to reset parameter 179 to its original value before using machine. Every machine will have its own set of unique values that should be compared to the original values at the time of installation. The values themselves can vary due to voltage, lube line lengths, restrictors and other factors, so monitoring these values over time is the only way to effectively diagnose and prevent problems that can lead to significant wear and damage to the machine. A reduced max pressure and/or reduced time to bleed off to zero indicate possible leaks in the system. A greater max pressure and/or shorter time to build to max pressure can be an indication of blockages in the system.

Lube Pump shot volume
Mechanical and Electronic lube pumps typically have some sort of lube shot volume adjustment. Adjust the volume for the shot to match the machine tool lubrication needs. See the Lube Pump manual for instructions on how to adjust the volume of oil for each lube shot.

How to create a ‘manual one shot lube’ macro for a Direct Controlled Lube pump.
In addition to automatic lube pump operation sometimes it is useful to have a “manual” method for the operator to activate a Direct Controlled lube pump as often there no button on a direct controlled pump to activate the pump or it is hard to get to since the pump may be located on the back of the machine etc...so...

Create an M code macro to turn on the Lube Pump output. This M code can be used in MDI mode or mapped to a free Aux key which will allow the operator to activate the lump pump ‘manually’ by pressing a button.

For Acorn users this macro is pre written in the comments of M55 to edit and activate simply edit the macro “mfuc55.mac” and remove the semi column in front of the Lube Pump One shot commands. Acorn M55 is pre-mapped to the Aux 8 key on the VCP (Virtual Operators Control Panel) so once the edit is complete the Aux 8 key acts as the Lube Pump Manual one shot button for a direct controlled pump.

Acorn M55 macro example:

```
;---------Example Macro for a Manual Lube Pump Aux Key--------------------------------------
; This Macro will activate the LubePump Logic in PLC and will keep pump on based on Parameter 179.
; Example: Parameter 179 = 1015, Then when this macro is activated the LubePump will have power ON for 15 seconds.
; A “ Lube pump Turn Off” Macro (M95) is not needed as the PLC resets the output in the logic when the ON timer is finished.
; Each time this m code is issued the “G-code running” timer is reset, so in our example P179=1015. After the pump has run for 15 seconds the “G code running” timer begins again to count down 10 minutes before the next automatic lube cycle.
; This macro can be used during a G code program, for example if the user wishes to pump some extra lube while the job is running.
; Uncomment the M94 Line Below to set Aux 8 VCP Aux key as a manual lube pump one shot button.
; This will set "SV_M94_M95_8" in the PLC, which a system variable used for lube pump operation that is pre-coded in the PLC.

;M94 /8
;M94 Requests to SET “ManualLubePump” in PLC.

;--------------------------------End of Example------------------------------------------
```
Parameter 178 — PLC I/O configuration

Most lube pumps have a low oil level switch, Parameter 178 is used to tell CNC12 what type of switch is being used a NC or NO switch.

Parameter 178 can be used to set switch types from NC to NO and some other options. Each Bit corresponds to a different function. All values are to be added to the current setting. For example, if you need to set the low lube input to normally open (NO) add 1 to this parameter.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
<th>Default State</th>
<th>Opposite State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Lube Fault</td>
<td>NC = OK</td>
<td>NO = OK Add 1</td>
</tr>
<tr>
<td>1</td>
<td>Spindle Fault</td>
<td>NC = OK</td>
<td>NO = OK Add 2</td>
</tr>
</tbody>
</table>

Note: If the Low Lube switch is triggered this will generate a CNC12 “405” error and will not let the operator run a G-code program or Enter MDI until the Low Lube input has been cleared. If the low lube error is triggered during a G code program, CNC12 will finish the G code program before issuing the 405 error.

NOTE: This parameter works only with specific PLC programs such as Acorn PLC programs generated by the Wizard and the "stock" PLC programs included with the CNC12 installer. The PLC program installed in the control MAY NOT be mapped as indicated below. These parameters should only be changed by a qualified technician.