DDCS Expert / M350 Master Skillset (Verified V1.22)

Role: Expert DDCS Macro Programmer.
Directives: Adhere to M350/Expert firmware architecture. Standard Fanuc rules do not apply.

⚠️ CRITICAL "CORE TRUTHS"

1. **NO G10 Commands:** G10 is broken. Use Direct Parameter Writing to WCS offsets.
2. **G53 Syntax Rules (VERIFIED):**
   - **VALID:** G53 X#100 (Must use Variables, Must NOT include G0/G1).
   - **INVALID:** G53 G0 X#100 (Do not combine G53 with G0).
   - **INVALID:** G53 X0 (Do not use hardcoded constants).
   - **FAILSAFE:** G91 Delta moves are still the safest backup.
3. **Variable Priming:** Always initialize user variables (e.g., #100=0) before assigning system variables.
4. **Display Formatting:** Use [%.3f] (square brackets) in #1505 messages.
5. **Parameter Mapping:** "Pr" numbers in the UI usually map to #Pr+500 (e.g., Pr1 = #501).

1. Verified Variable Map

Work Coordinate Offsets (Stride = 5)

To set a WCS Zero, write the Machine Coordinate to these variables.

System	Index (#578)	X	Y	Z	A
G54	1	#805	#806	#807	#808
G55	2	#810	#811	#812	#813
G56	3	#815	#816	#817	#818
G57	4	#820	#821	#822	#823
G58	5	#825	#826	#827	#828
G59	6	#830	#831	#832	#833

User Reference Constants (Your Machine Config)

Use these values to restore your Fence System or calculate Spoilboard height.

Reference	Axis	Value (Machine Coords)	Note
G54 Fence	**X**	**42.650**	Reference X0
G54 Fence	**Y**	**-661.186**	Reference Y0
Spoilboard	**Z**	**-87.336**	**Z0 Surface** (Use for safe Z calc)

Machine Coordinates (Read Only)

- **X:** #880 (Positive Space: 0 to Max)
- **Y:** #881 (**NEGATIVE SPACE**: 0 to -Max)
- **Z:** #882 (**NEGATIVE SPACE**: 0 to -Max)
- **A:** #883

Common System Parameters (Read/Write)

Macro Variable = UI Parameter No. + 500

Parameter (UI)	Variable	Description	Notes
Pr 0	**#500**	Start Speed	Min speed (mm/min) before accel
Pr 61	**#561**	Default Feed	Used if F is missing
Pr 70	**#570**	Z Lift Dist	Retract dist on Pause/Stop
Pr 82	**#582**	Max Spindle	RPM Limit
Pr 91	**#591**	Z Lift Enable	0=No, 1=Lift on Pause
Pr 122	**#622**	**X Back Home**	**Your Machine: 5.0mm (Positive)**
Pr 123	**#623**	**Y Back Home**	**Your Machine:**

			-5.0mm (Negative)
Pr 124	**#624**	**Z Back Home**	**Your Machine: -5.0mm (Negative)**
Pr 129	**#629**	**Probe Thick**	Thickness of Touch Plate (mm)
Pr 130	**#630**	Fixed Sensor	0=Disable, 1=Enable
Pr 132	**#632**	Probe Speed	Initial G31 Feedrate
Pr 135	**#635**	**Fixed Probe X**	Machine X for Fixed Sensor
Pr 136	**#636**	**Fixed Probe Y**	Machine Y for Fixed Sensor
Pr 269	**#769**	Debug Msg	**Set to 1** to enable #1503 text
-	**#578**	**WCS Index**	Active Work Coord System (1=G54)

User Storage Map (Verified Persistent Ranges)

Do not overwrite defined variables. Use "Available" slots for new macros.

Function	Variables	Source Macro / Status
Safe Park Position	**#1153** (X), **#1154** (Y)	SAVE safe park position.nc
Tool Change Position	**#1155** (X), **#1156** (Y)	SAVE tool change position.nc
Available	**#1157 - #1169**	**FREE**
Probe Config	**#1170 - #1175**	Reserved for config
Available	**#1176 - #1193**	**FREE**

Available (HUGE)	**#2000 - #2999**	**FREE (Verified Persistent)**

Persistence Rules

- **#0 - #499: NON-PERSISTENT** (Resets to 0 on reboot. Do not use for storage).
- **#1153 - #1193: PERSISTENT** (Verified Safe Gap).
- **#2000 - #2999: PERSISTENT** (Verified User Storage Block).

2. Verified Code Patterns

A. Universal "Set Current WCS Zero"

Sets Zero for whichever WCS is currently active.

```
(Target: Zero X axis on Current WCS)
#100 = 0
#100 = #578         ; Get Active WCS Index
#100 = #100 - 1     ; Normalize 0-5
#100 = #100 * 5     ; Stride
#[805 + #100] = #880 ; Write Machine X to Calculated WCS X
#1505 = -5000(Current WCS X Zeroed!)
```

B. Safe "Go To Machine Coordinate"

Method 1: G53 with Variables (Cleaner - Verified)
Strict Syntax: No G0/G1 allowed on the line. Variables Only.

```
(Target: Machine X=500, Y=-500)
#100 = 0
#101 = 0
#100 = 500    ; Set Target X (Positive Space)
#101 = -500   ; Set Target Y (Negative Space)
G53 X[#100] Y[#101]
```

Method 2: Incremental Delta (Proven Failsafe)
Use this if unsure.

```
(Target: Machine X=500, Y=-500)
#100 = 0
#101 = 0
#100 = 500 - #880   ; Delta X
#101 = -500 - #881  ; Delta Y (Target - Current)
G91
G0 X[#100] Y[#101]
```

```
G90
```

C. G-Code Parameter Brackets

You can use variables in S (Speed) and P (Dwell) if you use square brackets.

```
#140 = 12000
M03 S[#140]    ; Start Spindle at var speed
G04 P[3000]    ; Pause for 3 seconds (ms or sec depending on #592)
```

D. User Input Dialog

Ask the user for a number.

```
#2070 = 100(Enter Diameter:)  ; Input stored in #100
#1510 = #100
#1505 = 1(You entered: [%.3f])
```

E. Floating Puck Probe (Auto Z-Zero)

Probes Z and sets the active WCS Z Zero based on puck thickness parameter #629.

```
(Target: Auto-Zero Z using Puck Thickness #629)
(1. Prime Vars)
#100 = 0    ; Fast Speed
#101 = 0    ; Slow Speed
#102 = 0    ; Max Depth
#103 = 0    ; Thickness
#104 = 0    ; WCS Index
#105 = 0    ; WCS Address
#106 = 0    ; Calculated Offset

(2. Setup)
#100 = 200       ; Fast Feed
#101 = 20        ; Slow Feed
#102 = 20        ; Max Probe Dist
#103 = #629      ; Load Puck Thickness from Param

(3. Fast Probe)
G91
G31 Z-[#102] F[#100]
IF #1922 == 0 GOTO 999  ; Error if no hit
```

```
(4. Slow Probe)
G0 Z2            ; Retract 2mm
G31 Z-5 F[#101]   ; Slow probe
IF #1922 == 0 GOTO 999

(5. Set Zero on Active WCS)
#104 = #578           ; Get Active WCS Index (1-6)
#105 = 807 + [#104-1]*5 ; Calculate G5x Z-Offset Address (Stride 5)
#106 = #1927 - #103    ; Offset = Precision Hit Pos (#1927) - Thickness (#629)
#[#105] = #106        ; Write Offset directly to System Var
G0 Z10               ; Retract Safe
#1505 = -5000(Z Zero Set to Thickness [%.3f])
GOTO 1000

N999 #1505 = -5000(Probe Missed!)
N1000 G90
```

F. Restore G54 (Fence System)

Run this if you accidentally lose your G54 Reference.

```
(RESTORE G54 FENCE DEFAULTS)
(Prime Vars)
#805 = 0
#806 = 0
#807 = 0
(Write Hardcoded Values)
#805 = 42.650     ; Restore X
#806 = -661.186   ; Restore Y
#807 = -87.336    ; Restore Z (Spoilboard)
#1505 = -5000(G54 Fence Restored!)
M30
```

3. Standard Macro Template

```
%
(Title: <Macro Name>)
(Description: <Function>)

(--- PRIMING BLOCK ---)
#100 = 0
```

```
#101 = 0
#102 = 0
#1153 = 0

(--- STATE SAVE ---)
#100 = #4003 (Save G90/G91)

(--- MAIN LOGIC ---)
M5
G90

; [INSERT LOGIC HERE]

(--- STATE RESTORE ---)
G#100
M30
%
```