

Z for Niki T34 Infusion Pump

Sapna Jaidka

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YesNo ::= *yes* | *no*

SyringeBrand ::= *BDPlastipak*

CHAR ::= *CheckPlungerSensor* | *PumpPausedForTooLong_Beep* |

PumpPausedForTooLong_NoBeep | *Volume* | *Enter_Code* | *Incorrect_Code* |

Code_Accepted | *StartInfusion?* | *ConfirmSettings_PressYes* |

PumpDelivering_10mlBDPlastipak | *PumpStopped_PressYesToResume* |

Resume? | *ConfirmToResume* | *InfusionSummary* | *SetUpCode_Accepted*

PerCent : $\mathbb{P}\mathbb{Z}$

millilitres : $\mathbb{P}\mathbb{N}$

millimeters : $\mathbb{P}\mathbb{N}$

hours : $\mathbb{P}\mathbb{N}$

minutes : $\mathbb{P}\mathbb{N}$

millilitresperhour : $\mathbb{P}\mathbb{N}$

millilitres = 0 .. 100

PerCent = 0 .. 100

millimeters = 0 .. 10

hours = 0 .. 24

minutes = 0 .. 59

millilitresperhour = 0 .. 100

T34

BatteryCharge : PerCent

KeyPadLocked : YesNo

ProgramLocked : YesNo

TechMenuLocked : YesNo

Brand : SyringeBrand

SyringeSize : millilitres

VolumeLeft : millilitres

PlungerPosition : millimeters

SyringeOK : YesNo

BarrelOK , CollarOK , PlungerOK : YesNo

SystemReady : YesNo

VTBI : millilitres

Hours : hours

Minutes : minutes

InfusionRate : millilitresperhour

Init

T34

BatteryCharge = 90

KeyPadLocked = no

ProgramLocked = yes

TechMenuLocked = yes

Brand = BDPlastipak

SyringeSize = 10

VolumeLeft = 0

PlungerPosition = 10

SyringeOK = yes

BarrelOK = CollarOK = PlungerOK = yes

SystemReady = no

VTBI = 0

Hours = 0

Minutes = 0

InfusionRate = 0

SyringeWarnings

$\exists T34$

display! : *CHAR*

display! = *CheckPlungerSensor*

MoveActuatorFwd

$\exists T34$

ArmWarning

$\exists T34$

MoveActuatorBwd

$\exists T34$

SyringeDisplay

$\exists T34$

display! : *millilitres* \times *SyringeBrand*

display! = (*SyringeSize*, *Brand*)

ScrollSyringeList

$\exists T34$

SelectSyringe

$\exists T34$

InfoList

$\exists T34$

ScrollInfoListUp

$\exists T34$

ScrollInfoListDown

$\exists T34$

keypadLock

$\Delta T34$

BatteryCharge' = *BatteryCharge*
KeyPadLocked = *no* \Rightarrow *KeyPadLocked'* = *yes*
KeyPadLocked = *yes* \Rightarrow *KeyPadLocked'* = *no*
ProgramLocked' = *ProgramLocked*
TechMenuLocked' = *TechMenuLocked*
Brand' = *Brand*
SyringeSize' = *SyringeSize*
VolumeLeft' = *VTBI'*
PlungerPosition' = *PlungerPosition*
SyringeOK' = *SyringeOK*
BarrelOK' = *BarrelOK*
CollarOK' = *CollarOK*
PlungerOK' = *PlungerOK*
SystemReady' = *SystemReady*
VTBI' = *VTBI*
Hours' = *Hours*
Minutes' = *Minutes*
InfusionRate' = *InfusionRate*

BatteryLevel

$\Xi T34$

display! : *PerCent*

display! = *BatteryCharge*

TimeOut

$\Xi T34$

display! : *CHAR*

display! = *PumpPausedForTooLong_Beep*

StopAlarm

$\Xi T34$

display! : *CHAR*

display! = *PumpPausedForTooLong_NoBeep*

CurrentVolume

$\Xi T34$

display! : $CHAR \times \text{millilitres}$

display! = (*Volume*, *VTBI*)

CurrentSyringe

$\Xi T34$

display! : $\text{millilitres} \times \text{SyringeBrand}$

display! = (*SyringeSize*, *Brand*)

IncreaseVTBI

$\Delta T34$

BatteryCharge' = *BatteryCharge*

KeyPadLocked' = *KeyPadLocked*

ProgramLocked' = *ProgramLocked*

TechMenuLocked' = *TechMenuLocked*

Brand' = *Brand*

SyringeSize' = *SyringeSize*

VolumeLeft' = *VolumeLeft*

PlungerPosition' = *PlungerPosition*

SyringeOK' = *SyringeOK*

BarrelOK' = *BarrelOK*

CollarOK' = *CollarOK*

PlungerOK' = *PlungerOK*

SystemReady' = *SystemReady*

VTBI ≤ 10

VTBI' = *VTBI* + 1

Hours' = *Hours*

Minutes' = *Minutes*

InfusionRate' = *InfusionRate*

Decrease VTBI

$\Delta T34$

BatteryCharge' = BatteryCharge

KeyPadLocked' = KeyPadLocked

ProgramLocked' = ProgramLocked

TechMenuLocked' = TechMenuLocked

Brand' = Brand

SyringeSize' = SyringeSize

VolumeLeft' = VolumeLeft

PlungerPosition' = PlungerPosition

SyringeOK' = SyringeOK

BarrelOK' = BarrelOK

CollarOK' = CollarOK

PlungerOK' = PlungerOK

SystemReady' = SystemReady

VTBI > 0

VTBI' = VTBI - 1

Hours' = Hours

Minutes' = Minutes

InfusionRate' = InfusionRate

SetVTBI

$\Delta T34$

BatteryCharge' = *BatteryCharge*
KeyPadLocked' = *KeyPadLocked*
ProgramLocked' = *ProgramLocked*
TechMenuLocked' = *TechMenuLocked*
Brand' = *Brand*
SyringeSize' = *SyringeSize*
VolumeLeft' = *VTBI'*
PlungerPosition' = *PlungerPosition*
SyringeOK' = *SyringeOK*
BarrelOK' = *BarrelOK*
CollarOK' = *CollarOK*
PlungerOK' = *PlungerOK*
SystemReady' = *SystemReady*
VTBI > 1
VTBI' = *VTBI*
Hours' = *Hours*
Minutes' = *Minutes*
InfusionRate' = *InfusionRate*

SelectDigit

$\Xi T34$

display! : *CHAR*

display! = *Enter_Code*

IncorrectCode

$\Xi T34$

display! : *CHAR*

display! = *Incorrect_Code*

RateCodeAccept

$\Xi T34$

display! : *CHAR*

display! = *Code_Accepted*

IncreaseDuration

$\Delta T34$

BatteryCharge' = *BatteryCharge*

KeyPadLocked' = *KeyPadLocked*

ProgramLocked' = *ProgramLocked*

TechMenuLocked' = *TechMenuLocked*

Brand' = *Brand*

SyringeSize' = *SyringeSize*

VolumeLeft' = *VolumeLeft*

PlungerPosition' = *PlungerPosition*

SyringeOK' = *SyringeOK*

BarrelOK' = *BarrelOK*

CollarOK' = *CollarOK*

PlungerOK' = *PlungerOK*

SystemReady' = *SystemReady*

VTBI' = *VTBI*

$Minutes \leq 58 \Rightarrow (Minutes' = Minutes + 1 \wedge Hours' = Hours)$

$Minutes = 59 \Rightarrow (Minutes' = 0 \wedge ((Hours \leq 23 \Rightarrow Hours' = Hours + 1) \wedge (Hours = 24 \Rightarrow Hours' = 0)))$

InfusionRate' = *InfusionRate*

DecreaseDuration

$\Delta T34$

$BatteryCharge' = BatteryCharge$

$KeyPadLocked' = KeyPadLocked$

$ProgramLocked' = ProgramLocked$

$TechMenuLocked' = TechMenuLocked$

$Brand' = Brand$

$SyringeSize' = SyringeSize$

$VolumeLeft' = VolumeLeft$

$PlungerPosition' = PlungerPosition$

$SyringeOK' = SyringeOK$

$BarrelOK' = BarrelOK$

$CollarOK' = CollarOK$

$PlungerOK' = PlungerOK$

$SystemReady' = SystemReady$

$VTBI' = VTBI$

$(Minutes = 0 \wedge Hours = 0) \Rightarrow (Minutes' = 0 \wedge Hours' = 0)$

$Minutes \geq 1 \Rightarrow (Minutes' = Minutes - 1 \wedge Hours' = Hours)$

$Minutes = 0 \Rightarrow (Minutes' = 59 \wedge ((Hours \leq 1 \Rightarrow Hours' = Hours - 1) \wedge (Hours = 0 \Rightarrow Hours' = 0)))$

$InfusionRate' = InfusionRate$

SetNewDuration

$\Delta T34$

BatteryCharge' = *BatteryCharge*
KeyPadLocked' = *KeyPadLocked*
ProgramLocked' = *ProgramLocked*
TechMenuLocked' = *TechMenuLocked*
Brand' = *Brand*
SyringeSize' = *SyringeSize*
VolumeLeft' = *VolumeLeft*
PlungerPosition' = *PlungerPosition*
SyringeOK' = *SyringeOK*
BarrelOK' = *BarrelOK*
CollarOK' = *CollarOK*
PlungerOK' = *PlungerOK*
SystemReady' = *SystemReady*
VTBI' = *VTBI*
Hours > 0 \vee *Minutes* > 0
InfusionRate' = (60 * (*VTBI* div ((60 * *Hours*) + *Minutes*)))

CurrentRate

$\Xi T34$

display! : millilitresperhour

display! = *InfusionRate*

SaveSettings

$\Xi T34$

ConfirmMsg

$\Xi T34$

display! : CHAR

display! = *ConfirmSettings_PressYes*

CurrentVTBI

$\Xi T34$

display! : millilitres

display! = *VTBI*

CurrentDuration

$\Xi T34$

display! : *hours* \times *minutes*

display! = (*Hours*, *Minutes*)

StartInfusingMsg

$\Xi T34$

display! : *CHAR*

display! = *StartInfusion?*

Infusing

$\Delta T34$

BatteryCharge' = *BatteryCharge*

KeyPadLocked' = *KeyPadLocked*

ProgramLocked' = *ProgramLocked*

TechMenuLocked' = *TechMenuLocked*

Brand' = *Brand*

SyringeSize' = *SyringeSize*

VolumeLeft' = *VolumeLeft*

PlungerPosition' = *PlungerPosition*

SyringeOK' = *SyringeOK*

BarrelOK' = *BarrelOK*

CollarOK' = *CollarOK*

PlungerOK' = *PlungerOK*

SystemReady = *no*

SystemReady' = *yes*

VTBI' = *VTBI*

Hours' = *Hours*

Minutes' = *Minutes*

InfusionRate' = *InfusionRate*

TimeRemaining

$\Xi T34$

display! : *hours* \times *minutes*

display! = (*Hours*, *Minutes*)

DeliveringMsg

$\Xi T34$

display! : *CHAR*

display! = *PumpDelivering_10mlBDPlastipak*

Pause

$\Delta T34$

BatteryCharge' = *BatteryCharge*

KeyPadLocked' = *KeyPadLocked*

ProgramLocked' = *ProgramLocked*

TechMenuLocked' = *TechMenuLocked*

Brand' = *Brand*

SyringeSize' = *SyringeSize*

VolumeLeft' = *VolumeLeft*

PlungerPosition' = *PlungerPosition*

SyringeOK' = *SyringeOK*

BarrelOK' = *BarrelOK*

CollarOK' = *CollarOK*

PlungerOK' = *PlungerOK*

SystemReady = *yes*

SystemReady' = *no*

VTBI' = *VTBI*

Hours' = *Hours*

Minutes' = *Minutes*

InfusionRate' = *InfusionRate*

PumpStoppedWarning

$\Xi T34$

display! : *CHAR*

display! = *PumpStopped_PressYesToResume*

ResumeInfusing

$\Delta T34$

BatteryCharge' = *BatteryCharge*
KeyPadLocked' = *KeyPadLocked*
ProgramLocked' = *ProgramLocked*
TechMenuLocked' = *TechMenuLocked*
Brand' = *Brand*
SyringeSize' = *SyringeSize*
VolumeLeft' = *VolumeLeft*
PlungerPosition' = *PlungerPosition*
SyringeOK' = *SyringeOK*
BarrelOK' = *BarrelOK*
CollarOK' = *CollarOK*
PlungerOK' = *PlungerOK*
SystemReady = *no*
SystemReady' = *yes*
VTBI' = *VTBI*
Hours' = *Hours*
Minutes' = *Minutes*
InfusionRate' = *InfusionRate*

SyringeDisplay2

$\Xi T34$

display! : *CHAR*

display! = *Resume?*

ResumeConfirm

$\Xi T34$

display! : *CHAR*

display! = *ConfirmToResume*

SyringeStatusDisplay

$\Xi T34$

display! : *CHAR*

display! = *InfusionSummary*

<i>EventLogData</i>
$\exists T34$

<i>EventInfoDisplay</i>
$\exists T34$

<i>NextEvent</i>
$\exists T34$

<i>PrevEvent</i>
$\exists T34$

<i>SetUpCodeAccept</i>
$\exists T34$
<i>display!</i> : <i>CHAR</i>
<i>display!</i> = <i>SetUpCode_Accepted</i>