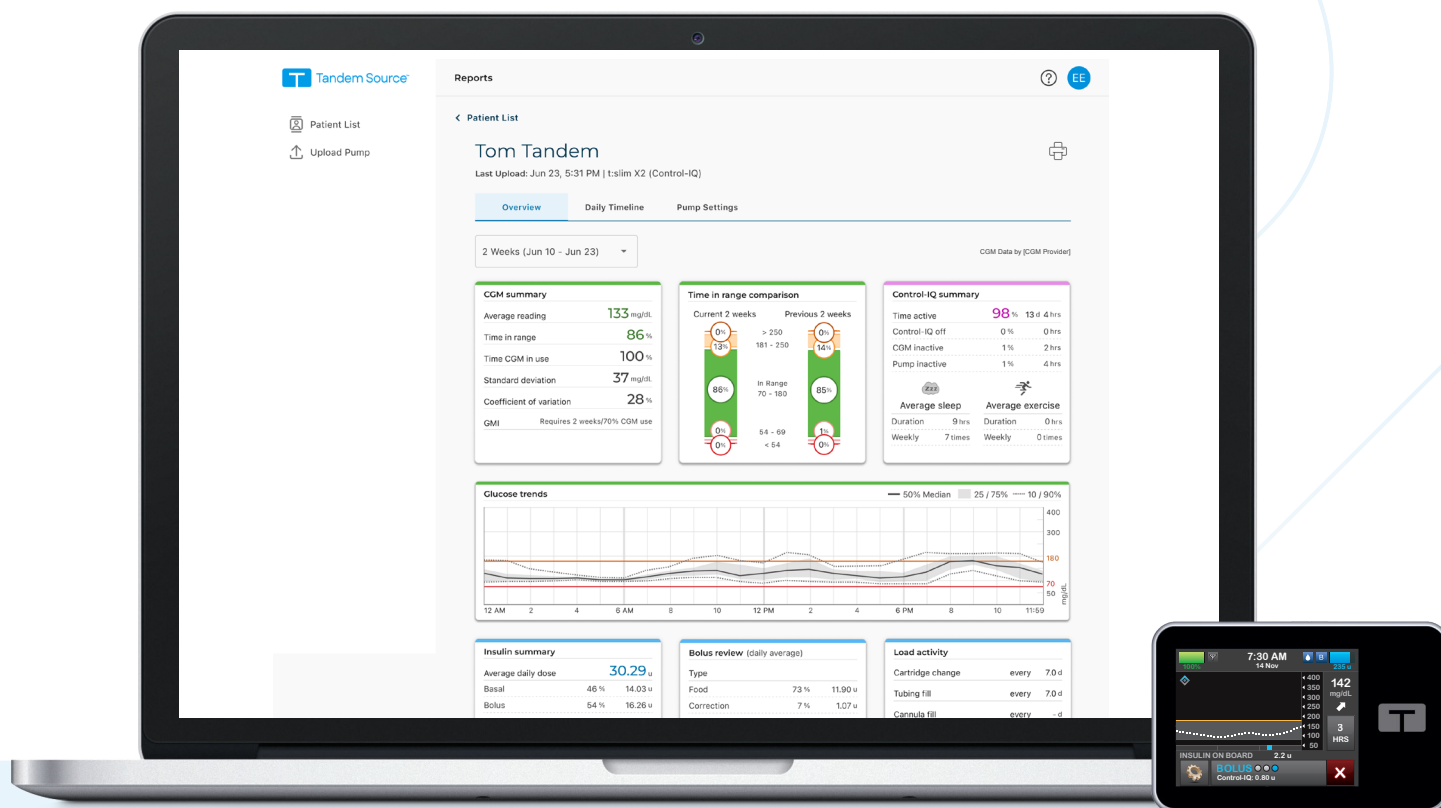**CONTENT ADAPTED WITH PERMISSION FROM THE PANTHER PROGRAM®**

How to Make Control-IQ Technology Adjustments Using Tandem Source

Instructions for Use

View User's Pump Data

Visit **source.tandemdiabetes.com** and upload pump data or view reports.

Save and Print Reports

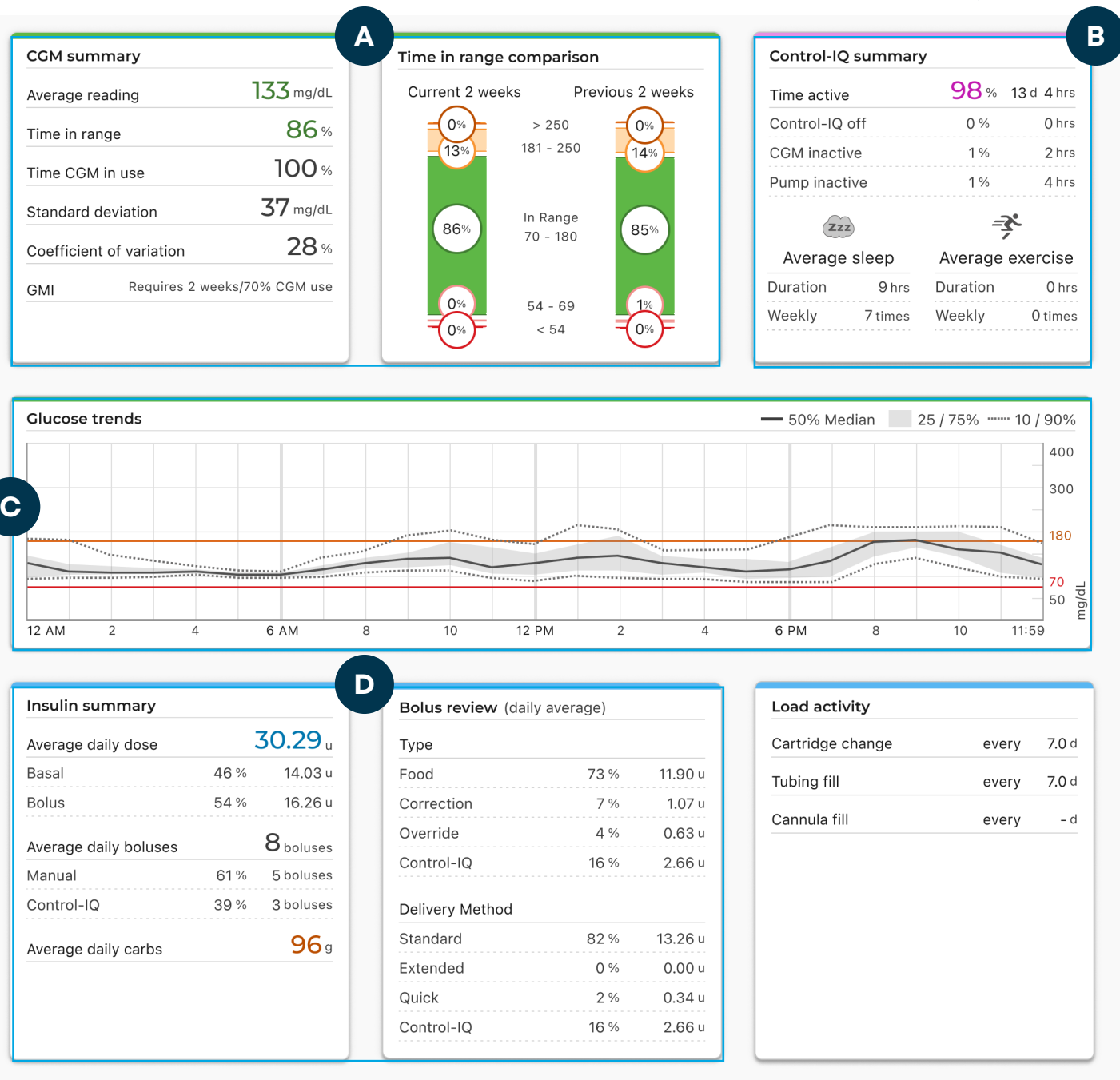Select Overview, Daily Timeline, and Pump Settings at last upload, and select a two week date range.

Follow the Worksheet

Get step-by-step guidance on clinical assessment, user education, and insulin dose adjustments.
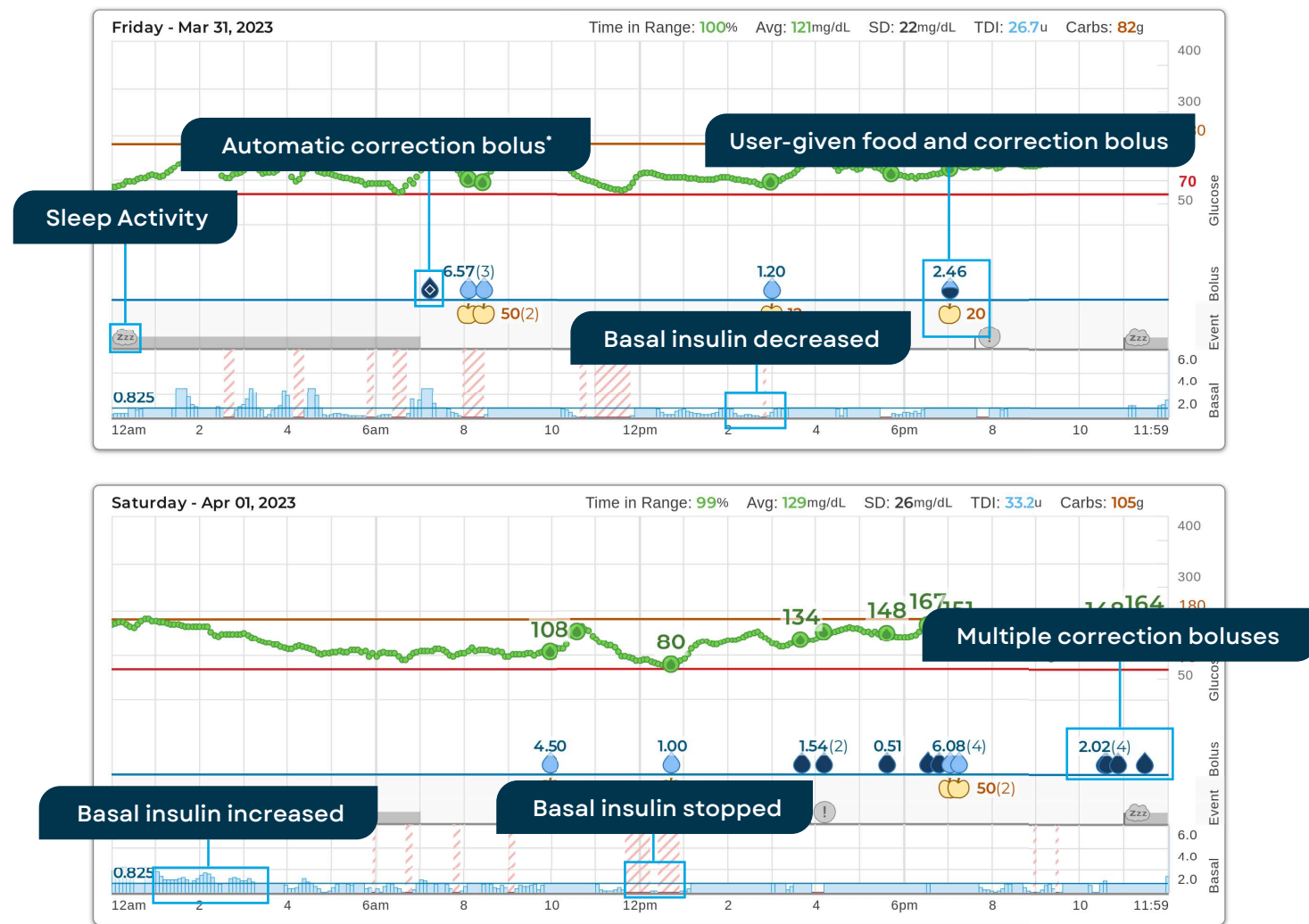
CGM Data by (CGM Provider)

CGM summary (A)

Average reading	133 mg/dL
Time in range	86 %
Time CGM in use	100 %
Standard deviation	37 mg/dL
Coefficient of variation	28 %
GMI	Requires 2 weeks/70% CGM use

Time in range comparison

	Current 2 weeks		Previous 2 weeks
> 250	0%		0%
181 - 250	13%		14%
In Range 70 - 180	86%		85%
54 - 69	0%		1%
< 54	0%		0%

Control-IQ summary (B)

Time active	98 %	13 d 4 hrs
Control-IQ off	0 %	0 hrs
CGM inactive	1 %	2 hrs
Pump inactive	1 %	4 hrs

Average sleep		Average exercise	
Duration	9 hrs	Duration	0 hrs
Weekly	7 times	Weekly	0 times

Glucose trends (C)

50% Median — 25 / 75% — 10 / 90%

(chart: glucose trends from 12 AM to 11:59 with levels 50, 70, 180, 300, 400 mg/dL)

Insulin summary (D)

Average daily dose	30.29 u	
Basal	46 %	14.03 u
Bolus	54 %	16.26 u
Average daily boluses	8 boluses	
Manual	61 %	5 boluses
Control-IQ	39 %	3 boluses
Average daily carbs	96 g	

Bolus review (daily average)

Type		
Food	73 %	11.90 u
Correction	7 %	1.07 u
Override	4 %	0.63 u
Control-IQ	16 %	2.66 u

Delivery Method		
Standard	82 %	13.26 u
Extended	0 %	0.00 u
Quick	2 %	0.34 u
Control-IQ	16 %	2.66 u

Load activity

Cartridge change	every	7.0 d
Tubing fill	every	7.0 d
Cannula fill	every	– d

(A) Are glycemic targets being met?[1]	(B) Is Control-IQ technology being used?	(C) Are there patterns of hypoglycemia and/ or hyperglycemia?	(D) Assess insulin delivery
Level 2 hypoglycemia: Time Below Range (TBR) <54 mg/dL, goal is <1% **Level 1 hypoglycemia:** TBR 54-69 mg/dL, goal is <4% **Time in range (TIR):** 70-180 mg/dL, goal is >70% **Level 1 hyperglycemia:** Time Above Range (TAR) 181-250 mg/dL, goal is <25% **Level 2 hyperglycemia:** TAR >250 mg/dL, goal is <5%	**Time Control-IQ in use (Percent of time that Control-IQ technology is in use):** Aim for >90%. If less, assess why. **CGM inactive (Time sensor not active):** Aim for <10%. If more, assess why. **Daily sleep:** Recommended to program Sleep Schedule. **Weekly exercise events:** Assess use of Exercise Activity and outcomes.	**Use Glucose trends to understand average glucose data throughout the day.** Assess and identify glycemic trends throughout the morning, afternoon, evening, and overnight. Focus on the areas where the average glucose is out of target range. The median line (where half of the glucose values are above and half are below) should ideally be mostly flat and within the target range of 70-180 mg/dL. 25/75% shows 50% of the glucose values; ideally, shaded area is narrow. 10/90% shows where 10% of values are below (bottom dotted lined) and 10% are above (top dotted line); ideally the closer the dotted lines are to the darker shaded area, the better.	**Ratio of basal to bolus delivery:** Basal percentage typically between 40-60%[2] If not, assess why (activity level, bolus behaviors, types of meals, increased interaction with system). **Consider verifying user's settings:** See back of handout for instructions on how to calculate. **Types of boluses:** Assess types of meals/ timing of bolus, carb counting knowledge, and carb ratios.

02 Reasons

Friday - Mar 31, 2023

Time in Range: **100%** | Avg: **121**mg/dL | SD: **22**mg/dL | TDI: **26.7**u | Carbs: **82**g

- Sleep Activity
- Automatic correction bolus*
- User-given food and correction bolus
- Basal insulin decreased

6.57(3) · 1.20 · 2.46

Saturday - Apr 01, 2023

Time in Range: **99%** | Avg: **129**mg/dL | SD: **26**mg/dL | TDI: **33.2**u | Carbs: **105**g

- Basal insulin increased
- Basal insulin stopped
- Multiple correction boluses

108 · 80 · 134 · 148 · 167 · 164

4.50 · 1.00 · 1.54(2) · 0.51 · 6.08(4) · 2.02(4)

Identify the predominant causes of a hypoglycemia or hyperglycemia pattern

Is a hypoglycemia pattern occurring?

- ✓ Fasting/overnight?
- ✓ After meal bolus? (1-3 hours after)
- ✓ Following hyperglycemia events?
- ✓ During or after exercise?

Is a hyperglycemia pattern occurring?

- ✓ Fasting/overnight?
- ✓ After meal bolus? (1-3 hours after)
- ✓ Following hypoglycemia events?

03 Solutions

| Pattern	Primary Safety Goal: Reduce Hypoglycemia (<70 mg/dL) to <4% Primary Overall Goal: Increase TIR (70-180 mg/dL) to >70%	
	Hypoglycemia	**Hyperglycemia**
	Solution	Solution
Fasting/ overnight	Recommend Sleep Schedule is set nightly. Reduce basal rates 10-20% 1-2 hours prior to hypoglycemia.	Recommend Sleep Schedule is set nightly. Increase basal rates 10-20% 1-2 hours prior to hyperglycemia.
After mealtime (1-3 hours after meal boluses)	Weaken the carb ratios by 10-20% (e.g., if 1:10, change to 1:12).	Strengthen carb ratios by 10-20% (e.g., if 1:10, change to 1:8). Consider timing of bolus.
Following high glucose	Weaken the correction factor by 10-20% (e.g., if 1:50, change to 1:55). This will impact both user-given and automatic correction boluses.	Strengthen the correction factor by 10-20% (e.g., if 1:50, change to 1:45). If unexplained hyperglycemia persists, refer to "Infusion Site Tips" on next page.
Following low glucose	Evaluate Insulin on Board. Treat extended hypoglycemia with 15g of carbs and recheck glucose in 15 minutes. Repeat as necessary.	Treat mild hypoglycemia with fewer grams of carbs (5-10g), especially after periods of reduced/ suspended insulin delivery.
After a correction bolus was given (1-3 hours after)	Weaken the correction factor by 10-20% (e.g., if 1:50 change to 1:55). Avoid overriding recommended doses.	Strengthen correction factor by 10% (e.g., if 1:50 change to 1:45).
During or after exercise	Use Exercise Activity feature (timing varies based on intensity of physical activity). Consider alternate Personal Profile.	Educate on proper type, amount, and timing of additional carb intake prior to exercise.

Adjust insulin pump settings

Consider calculating pump settings based on Total Daily Insulin (TDI) if the user not reaching desired TIR or has multiple timed settings within their profile (potentially from users transitioning from prior pump therapy). Can use "Calculating Pump Settings" table on the back for settings recommendations.

Adjustable parameters

Basal rates, carb ratios, and correction factors can be modified to patient needs. Target range values are preset to 112.5-160 mg/dL if Control-IQ technology is enabled, or modified to 112.5-120 mg/dL during Sleep Activity and 140-160 mg/dL during Exercise Activity. Correction factor directly impacts how Control-IQ technology automates insulin delivery, including bolus delivery. Studies show a more aggressive correction factor is associated with higher time in range with negligible impact to hypoglycemia.[3]

Personal Profiles

Up to six Personal Profiles can be created to personalize anticipated changes in insulin requirements.
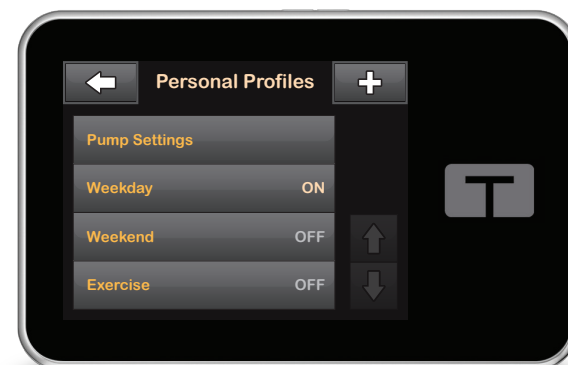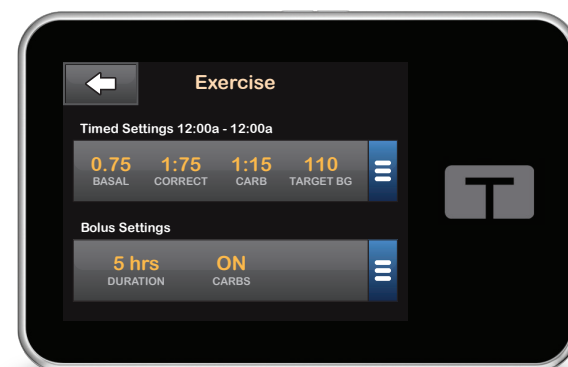
Infusion Site Tips

When in doubt, change it out:

- ✓ If unexplained hypergly-cemia persists (i.e., >250 mg/dL for >90 minutes)
  - 01 Correct by injection
  - 02 Change infusion set, site, and cartridge
  - 03 Check for ketones

Other times to change infusion set:

- ✓ If wetness (possible leaking) or redness/swelling (possible infection) at site
- ✓ If not changed within 2-3 days
- ✓ If insulin or infusion set is expired
- ✓ Rotate site often to avoid scar tissue/lipohypertrophy
- ✓ If experiencing repeated infusion site problems, try different cannula length or infusion set

Disconnecting:

- ✓ If disconnecting from the pump, suspend insulin so Control-IQ technology calculates insulin on board accurately and continue to monitor glucose
- ✓ If disconnecting for 1-4 hours, deliver bolus if hyperglycemia occurs. Reduce amount for activity if neccessary.
- ✓ If disconnecting for more than four hours, have injections available as a backup plan
- ✓ Always disconnect from site on body, not the tubing connector

Calculating Pump Settings

Basal Rate	Total Daily Basal Units	Pump TDI x %Basal (40-60%) = Total Daily Basal[2,4,5]	_____ Pump TDI	UNITS/ DAY	×	$\dfrac{0.4\text{-}0.6}{\%Basal}$	=	_____UNITS/DAY (Total Daily Basal)	
	Initial Basal Rate	Total Daily Basal ÷ 24 hours = Initial Basal Rate[2,4,5]	_____ Total Daily Basal	UNITS/ DAY	÷	24 HOURS	=	_____UNITS/HOUR (Initial Basal Rate)	
Correction Factor	–	1700[†] ÷ Pump TDI = Correction Factor[2,4]	1700	÷	_____ Pump TDI	UNITS/ DAY	=	_____MG/DL: 1 UNIT (Correction Factor)	
Carb Ratio	–	450 ÷ Pump TDI = Carb Ratio[5]	450	÷	_____ Pump TDI	UNITS/ DAY	=	_____GRAMS: 1 UNIT (Carb Ratio)	

[†]Can recalculate using 1450-2200

Responsible Use of Control-IQ Technology

Even with advanced systems such as the t:slim X2 insulin pump with Control-IQ technology, users are still responsible for actively managing their diabetes. Control-IQ technology does not prevent all high and low blood glucose events. The system is designed to help reduce glucose variability, but it requires that users accurately input information, such as meals and periods of sleep or exercise. Control-IQ technology will not function as intended unless all system components, including CGM, infusion sets and pump cartridges, are used as instructed. Importantly, the system cannot adjust insulin dosing if the pump is not receiving CGM readings. Because there are situations and emergencies that the system may not be capable of identifying or addressing, users should always pay attention to their symptoms and treat accordingly.

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* If glucose values are predicted to be above 180 mg/dL, Control-IQ technology calculates a correction bolus using the Personal Profile settings and a target of 110 mg/dL and delivers 60% of that value.

References: 1. Diabetes Technology: Standards of Care in Diabetes - 2024. *Diabetes Care.* 2024;47(Suppl. 1):S126-S144. doi: 10.2337/dc24-S007. **2.** Walsh J, Roberts R. *Pumping Insulin: Everything for Success on an Insulin Pump and CGM.* 6th ed. San Diego, CA: Torrey Pines Press; 2016. **3.** Messer LH, Breton M. Therapy Settings Associated with Optimal Outcomes for t:slim X2 with Control-IQ Technology in Real World Clinical Care. *Diabetes Technol Ther.* 2023;25(12):877-882. doi: 10.1089/dia.2023.0308 **4.** Grunberger G, Abelseth JM, Bailey TS, et al. Consensus Statement by the American Association of Clinical Endocrinologist/American College of Endocrinology Insulin Pump Management Task Force. *Endocr Pract.* 2014;20(5):463-489. doi: 10.4158/EP14145.PS **5.** Hinnen D, DeGroot J. Therapy Intensification: Technology and Pain Management. In: *The Art and Science of Diabetes Care and Education.*5th ed. Chicago: Association of Diabetes Care and Education Specialists; 2021:592-593.

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