1.1 INTRODUCTION

This service manual provides information for the installation, operation, and maintenance of the TARUS GUN DRILL, Models:

- GD 4860
- GD 6096
- GD 6096 H.D.

used with the TPI-8000 Computerized Numerical Control System.

1.2 MACHINE IDENTIFICATION

The information contained in this manual and all related literature supplied with this machine applies to the following model:

- Model Number: _____
- Serial Number: _____
- CNC System: _____

Operators and computer programmers should thoroughly familiarize themselves with the information provided to insure efficient machine performance. A master assembly drawing and parts list is included to assist in ordering parts and in assembling the machine.

1.3 GENERAL DESCRIPTION

1.3.1 Models

All TARUS Gun Drills are precision, column-type, horizontal-spindle, traveling-table drilling machines which provide deep hole-drilling penetration capability with speed, accuracy, and ease of operation. (Fig. 1).

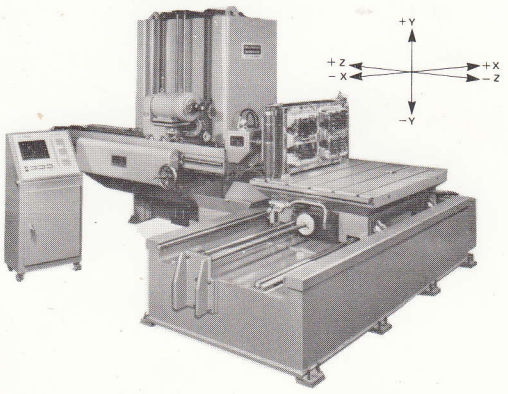

Fig. 1 — Tarus Products Gun Drill Model GD 4860

1.3.2 Machine Sizes

Three machine sizes are offered ranging in workholding capacity from 30,000 lbs (13,600 kg.) to 40,000 lbs (18,200 kg.).

- Model GD 4860 features a 48 x 60-in. table with 48 in. vertical carrier travel (Y axis), 60 in. horizontal table travel (X axis), 84 in. drill depth travel (Z axis) and 30,000-lb. workpiece capacity.
- Model GD 6096 features a heavy-duty 60 x 96-in. table with 48 in. vertical carrier travel, 96 in. horizontal table travel, 84 in. drill-depth travel, and a workpiece capacity of 30,000 lbs. The heavy duty Model (GD 6096 H.D.) has 40,000-lb. workpiece capacity.

All models are capable of drilling straight holes from .1875 in. to 1 in. diameter up to 84 in. deep in materials varying in hardness to 50 Rockwell.

1.3.3 Construction

Machine-tool quality, stress-relieved, ribbed-weldment design used in the construction of the TARUS PRODUCTS Gun Drill provides extreme structural rigidity for all major components: column, carrier, slide, bed, and table.

The TARUS Gun Drill table, carrier, and slide are all supported on heat-treated, alloy-steel precision way guides by anti-friction rollers featuring pre-loaded, adjustable bearings that maintain flatness and squareness to within .001 in. along with X-Y-Z axes. Rollers are equipped with the way wipers to prevent dirt and chips from entering between way surfaces. (Fig. 2).

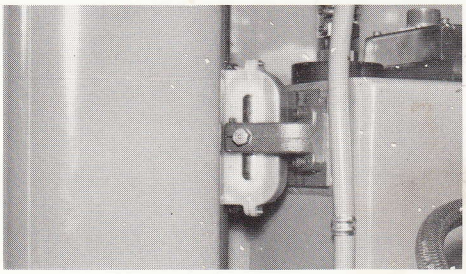

Fig. 2 — Way Guide Roller Bearings

1.3.4 Feed Drives

TARUS PRODUCTS Pulse Width Modulation (PWM) drives and torque motors comprise the feed drive mechanisms which provide smooth DC response both in forward and reverse modes, under full or partial power input. All feed drives are equipped with anphenol plug-in connectors. Feed-drive assemblies feature bolt-on mounting plates for ease of installation and removal. The X- and Y-axis feed drives are interchangeable. Each contains the feed drive, mounting plate, preloaded bearings for the ballnut, magnetic brake, and handwheel. (Fig. 3).

The Z-axis feed-drive assembly contains the feed drive, mounting plate, and planetary gear box.

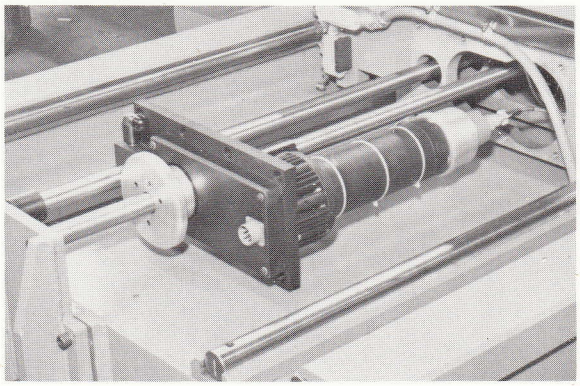

Fig. 3 — Feed Drive Motor Assembly

1.3.5 CNC System

Machining functions are controlled automatically by the TPI-8000 Microprocessor Control. (Fig. 4). Data is entered by numerical tape, disk, or manual data input (MDI).

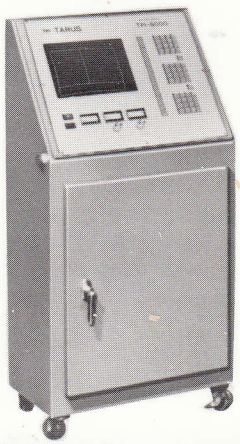

Fig. 4 — TPI-8000 Microprocessor Control

Basic machine motions controlled by the TPI-8000 are: X axis-table (horizontal left-right); Y axis-column and carrier (vertical up/down); Z axis-slide and spindle (horizontal in/out).

TARUS PRODUCTS also offers SENTAR, an optional office computer system that permits future jobs to be engineered, programmed, and stored on disk ready for callup by an operator on the floor. SENTAR can be linked to the TPI-8000 (and other TARUS machine controls) with a standard terminal communications line. Because of its two-way communications ability, SENTAR allows an operator to manually program a drilling sequence into the TPI-8000 and transmit this information to the SENTAR storage bank for later recall. (Fig. 5).

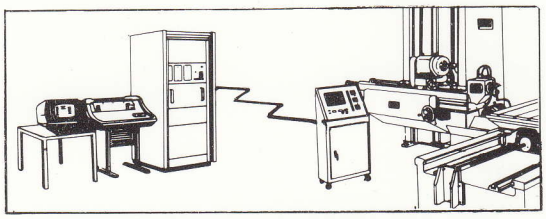

Fig. 5 — SENTAR Office Computer System

1.3.6 Carrier and Column

The carrier and column are rigid, machine-tool quality steel weldments used to support the slide, spindle, and chip box assembly. The assembled carrier is held in the column and balanced with a 6,000 lb. (2,720 kg) counterweight. It is guided in roundways by four independent, anti-friction, adjustable roller bearings which assure accurate alignment of the carrier assembly with the Y axis.

1.3.7 Table and Base

The table and base are rigid, machine-tool quality steel weldments designed to support workpieces up to 40,000 lbs. The table traverses the base along the X axis on roundways using independent, anti-friction adjustable roller bearings which assure accurate alignment of the table with the X axis.

1.3.8 Column and Base

The column is a rigid, machine-tool quality steel weldment which is secured to the base with heavy bolts. The positive, fixed relationship and accuracy of the column and base in the X-Y planes is provided for by the precision-machined column flange and base flange which form the mating surface of the two components.

1.3.9 Slide

The machined steel slide supports the spindle, chip box, tap unit, and Z-axis feed drive and ball screw. The slide moves horizontally across the carrier supported on way guides by independent, anti-friction, adjustable roller bearings which assure accurate alignment of the slide with the Z axis. (Fig. 6).

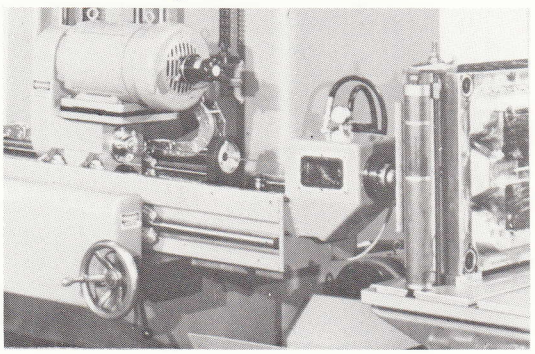

Fig. 6 – Z Axis Steel Slide

1.3.10 Spindlehead

Spindlehead functions are controlled automatically by the TPI-8000 Microcontrol from data supplied by tape, disk or MDI input. Spindle drive is provided for by an infinitely variable 7.5-h.p. DC drive motor linked to the spindle by timing belt.

Spindle speed and drill feed rate controls are synchronized to allow the operator to maintain constant chip-load production during drilling.

1.3.11 Spindle

The spindle is made of hardened alloy steel, ground for roundness and straightness. It is supported in the spindlehead by preloaded, permanently lubricated anti-friction ball bearings. A hole through the center of the spindle allows high-pressure cutting oil to flow to the cutting tool.

1.3.12 Whip Guides

Whip guides are used to support the drill in the slide during machine operation. The drill is inserted through a plastic bushing which is pressed into a support bearing. The bearing is pressed into an adapter which fits into the whip guides (and the chip box). (Fig. 7).

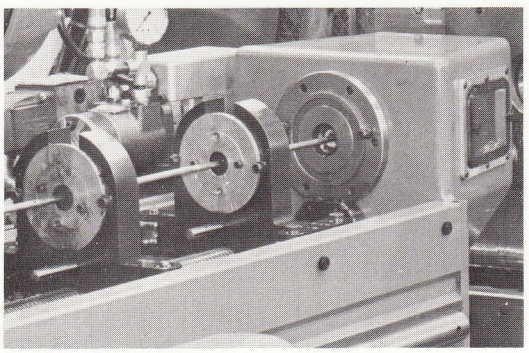

Fig. 7 – Whip Guide Assembly

Bushings are offered in five size ranges, each matched to a particular drill-size grouping. Bearings and adapters are designed in five sizes to accommodate the five bushing ranges. The whip guides are supported in the slide on preloaded needle and ball rollers which mount on the guideways. Guides can be removed or added as required by first removing a side rail located on the slide near the chip box assembly. (Fig. 8).

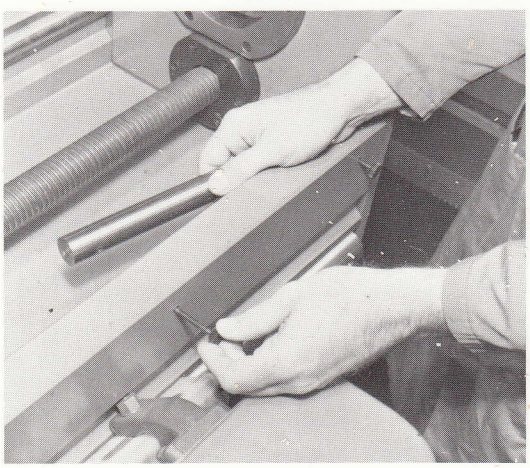

Fig. 8 – Side Rail Removal

1.3.13 Chip Box Assembly

The chip box assembly is designed to accurately guide the gun drill and direct cutting oil and chips away from the workpiece during drilling. An air-powered, traveling tool-guide assembly mounted in the chip box seals firmly against the flat surface of the workpiece to accurately start the gun drill and eliminate oil spray during drilling. The chip box is bolted securely to the slide. (Fig. 9).

A plastic window mounted on the chip box allows the operator to inspect oil flow and chip production.

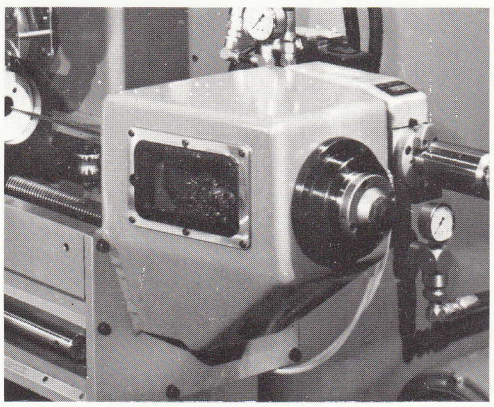

Fig. 9 – Chip Box

1.3.14 Tapping & Counterbore Units

Optional tapping and counterbore units are designed to mount securely to the slide and permit completion of secondary operations while the workpiece is fixtured to the table. The units are powered by an independent hydraulic systems. (Fig. 10).

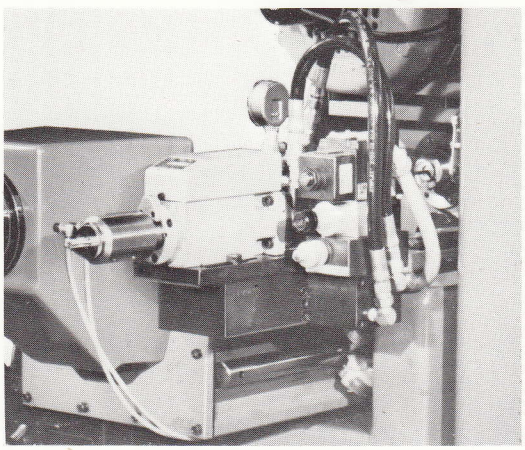

Fig. 10 – Tapping Unit

1.3.15 Coolant System

The coolant system is powered by a 10 h.p. AC motor which drives a vane pump rated at 30 g.p.m. at 1,000 p.s.i. High-pressure coolant oil flows from a hydraulic line into the spindle bar through a rotary coolant union connector.

The oil travels through the drill to the cutting surface where the spent oil pushes chips out of the hole along the drill flute into the chip box. Oil falls into the chip trough and is directed to a baffled reservoir in the base. The oil is pumped by a 2-h.p. motor through a 40-micron filter back into the base to the fresh oil reservoir connected by an oil line to the high-pressure pump inlet.

1.3.16 Measurement System

Linear accuracy of movements along the X axis (table travel and Y axis (carrier travel) are maintained within standard precision ball screw tolerances. Accuracy of the Z axis (spindle drive) movement is within normal roll thread ball screw tolerances.