

Wayside scanner reads car numbers and lightweight.

Label strips have adhesive backing for easy attachment.

Cars identified automatically

Duluth, Missabe & Iron Range is the first U.S. railroad to purchase an automatic car identification system to use as a daily operating tool. Known as KarTrak, the system is designed and built by Sylvania Electronic Systems. It is to be fully operative at the start of the lake shipping

season next spring.

The railroad is installing 3M Scotchlite retroreflective labels on 9,500 hopper cars and 88 locomotives. Labels, one on each side of the car are made up of combinations of black, blue, orange and white stripes which indicates car number and light weight.

Similar labels on locomotives will have two digits (44) to identify locomotives to the KarTrak system, and three digits to identify the locomotive number.

In addition to labeling, the ACL system will include two wayside scanners and a decoding unit at the Proctor, Minn., yard. Here, loaded cars are weighed prior to delivery to the docks at Duluth. As these loaded cars are moved toward a track scale, a KarTrak scanner will read the number and light weight. At the scales, the gross weight of each car is matched against the light weight, as represented by the 3M label, and the net weight is automatically calculated. This net or ore weight is fed to a teleprinter tape punch. This ore weight along with its associated car number is fed via teleprinter circuits to other yards, docks, DM&IR operations center and mining companies.

After weighing, the cars are made up into trains for delivery to the docks at Duluth, Minn., where the ore is dumped into lake boats. As these trains leave Proctor yard, another KarTrak scanner will read the locomotive numbers and car numbers to verify the train consist.

D. B. Shank, vice-president and general manager, states: "We on the DM&IR are proud to be the first railroad in the country to utilize automatic car identification in our daily operation. Naturally, we are constantly searching for new tools to improve performance and to provide better services to our customers. KarTrak provides us with such a tool."

The KarTrak system operates on principles of light reflection and color separation (RS&C, June 1963, p 22).

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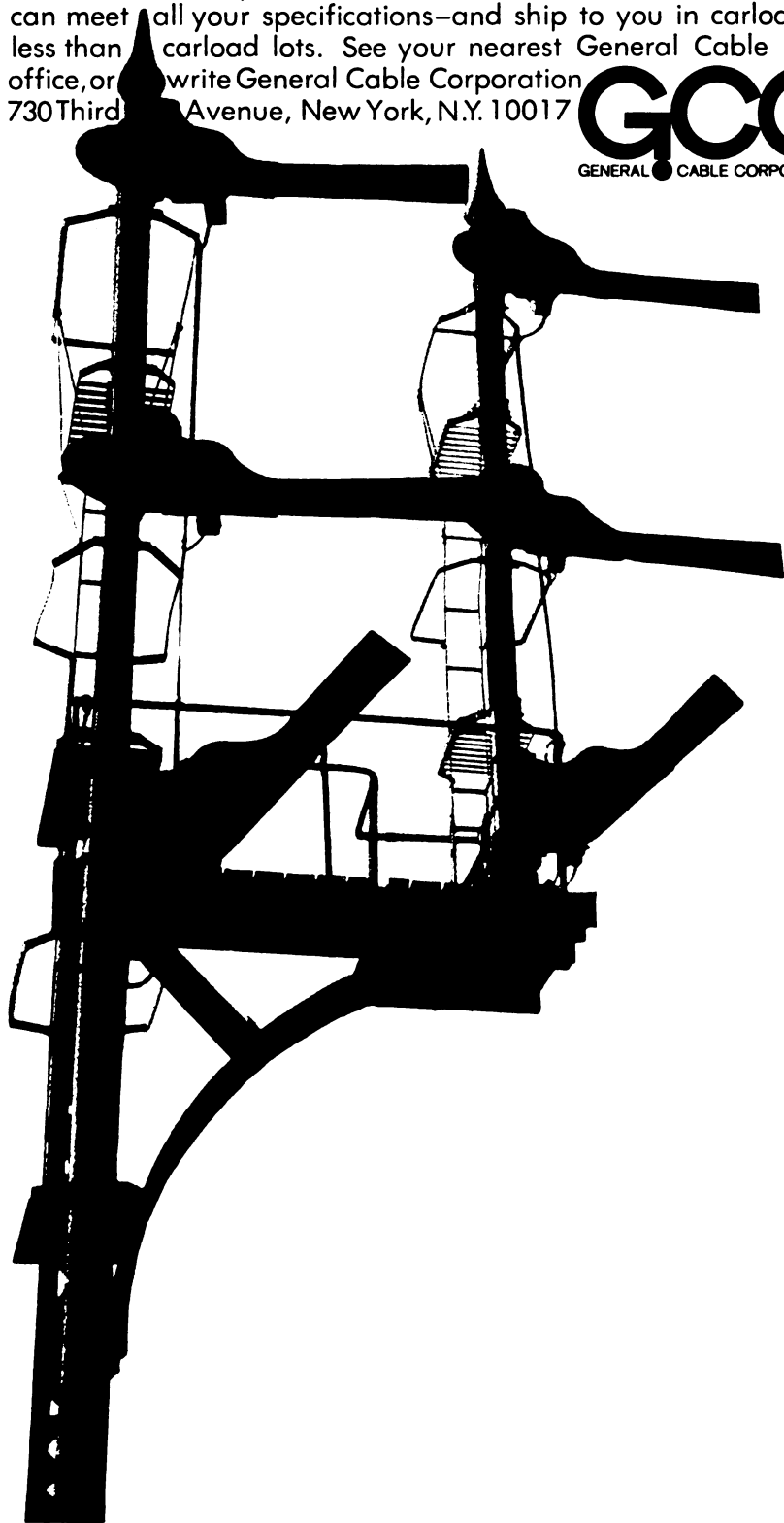
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DM&IR HAS ACI

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Light is reflected off the car label, which consists of pairs of $\frac{3}{8}$ " high by 6" wide stripes representing digits. For example, a combination of orange and white stripes represents a "7". In addition to digit combinations, read start and read stop stripes are used at the bottom and top of each label, respectively. The wayside scanner reads the label from bottom to top.

In operation, light from an aircraft-type, sealed-beam lamp is reflected by the silvered portion of a partially silvered mirror to one of the flat mirrored surfaces of a 15-sided rotating scanning wheel. From this wheel mirror, the light beam is reflected to the label on the passing car.

Reflected light from the label is returned to the rotating mirror on the scanning wheel, passed through the unsilvered part of the partially silvered mirror and, through a lens system, is focused onto a narrow slit, sized to "see" about one-half of a single color stripe. Light passing through the slit falls on a dichroic mirror designed to reflect blue light and transmit orange light. Further color discrimination is obtained by filters placed in front of the "blue" and "orange" photocells. A blue label material then produces an electrical signal from the "blue" photocell; an orange label, a signal from the "orange" photocell; a white material or label, a signal from both photocells; and a non-retroreflective material (black or blank), no signal from either cell.

IDENTIFICATION PULSES

The signals from each photocell are processed by two identical blue and orange channel amplifiers, then combined to form a series of identification pulses in the same sequence as the colored stripes making up the label. These signals are correlated with signals from the transducer wheel counter and fed into electronic equipment to provide the correct identification print out or read out.

According to 3M representatives, car labeling materials cost about \$1.38, and the total cost to label a car—one label on each side—would be approximately \$2.50 including the 15 man-minutes for installation. The surface of the car is abrasively scoured before application. The label material has an adhesive backing for direct application to the car side. DM&IR labels will also contain two digits for use as variable information. What this information will be has not been indicated by the railroad.

RS&C