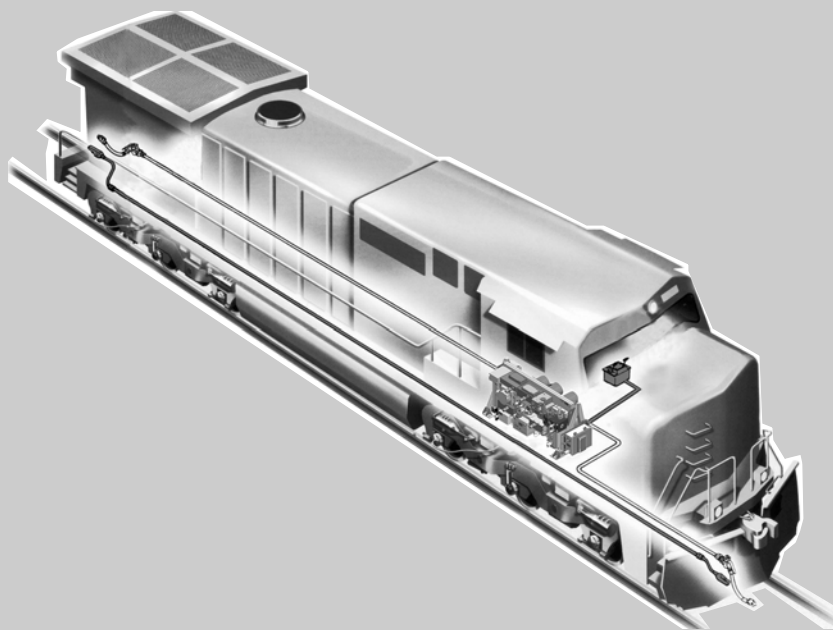


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**IP - 245**

Rev. 01 (1/13/09) -en  
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**CCB-26 Locomotive Brake System**  
**Selection Guide**



**KNORR-BREMSE**





**NEW YORK AIR BRAKE**

CCB-26 Locomotive Brake System

Selection Guide

Doc. No. IP-245

Revision: 01 1/13/09-en

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## 1 Definitions

### 1.1 Terms

Not applicable.

### 1.2 Abbreviations

BCCP	Brake Cylinder Control Portion
BPCP	Brake Pipe Control Portion
DBI	Dynamic Brake Interlock
DBTV	DB Triple Valve Portion
EBV	Electronic Brake Valve
EIE	Engineer Induced Emergency
ELF	Extra Low Friction
EPCU	Electro-Pneumatic Control Unit
ERCP	Equalizing Reservoir Control Portion
HF	High friction
LRU	Line Replaceable Unit
PCP	Penalty Control Portion
PCS	Power Cut-Off Switch
PSJB	Power Supply Junction Box
RCP	Relay Control Portion
13CP	13 Control Portion
16CP	16 Control Portion
20CP	20 Control Portion



### 1.3 Referenced Documents

<b>Doc. No.</b>	<b>Doc. ID</b>	<b>Issue</b>	<b>Publisher</b>
1	Engineering and Design of Railway Brake Systems	2004	Air Brake Association

## 2 Description

### 2.1 General Description of the CCB-26 System

The CCB-26 system is designed to function as a direct replacement for an AAR, freight 26L system with brake pipe, independent application and release pipe, and actuating pipe. The system is a microprocessor based electro-pneumatic brake control system. Equalizing Reservoir, Brake Pipe Control and IA&R Pipe control are managed by computer electronics. Brake Cylinder control is fully pneumatic and Actuating Pipe control is electro-pneumatic. The system does not include Passenger mode (graduated release) functionality.

The system includes standard penalty pipe logic for 3-pipe suppressible penalty requests, 10-pipe non-suppressible penalty requests and 26-pipe suppression functionality.

The CCB-26 system controls Lead/Trail functions and brake pipe cut-in and cut-out through the use of rotary selector knobs mounted on the Electronic Brake Valve (EBV).

The CCB-26 system is designed to operate with pneumatic gauges and selector switches as the operator interface. It is not intended for locomotives that have a locomotive computer and/or screen interface requirement.

The CCB-26 system is upgradeable to be a CCB II or Locotrol-EB system.

### 2.2 EPCU

The CCB-26 system is comprised of distributed electronics that are linked via a network. The Electro-Pneumatic Control Unit (EPCU), mounted in the locomotive brake bay, consists of modularized line replaceable units (LRU's) that control the development of all pneumatic control pressures (see Figure 1).

2.2.1 \*Four of the LRUs are 'intelligent' and communicate via the network. They are:

- **Brake Pipe Control Portion (BPCP)** - The primary function of the brake pipe control portion is supply, exhaust, maintaining and cut-off of trainline brake pipe. The BPCP includes the brake pipe relay valve, emergency magnet valve and vent valve, and brake pipe cut-out function as well as break-in-two detection and brake pipe pressure sensing.
- **Equalizing Reservoir Control Portion (ERCP)** -The primary function of the ERCP is control of the brake pipe relay. The ERCP controls equalizing reservoir pressure. The pneumatic and electrical control portions of the ERCP include emulation of the #3, #10, and #26 pipes. Optional penalty magnet valves can



be piped to the manifold #3 pipe port for suppressible penalties, and to the #10 pipe port for non-suppressible penalties. In this manner, the penalty interface is identical to a 26L pneumatic braking system.

- 20 Control Portion (20CP) - The 20CP provides independent application and release pipe pressure.
- \*Relay Control Portion (RCP) - Mounted on the EPCU, the RCP contains the systems relays, and provides discrete signal interface to Locomotive controls and sanding equipment.

## NOTICE

### \*NOTE

On some applications the Relay Control Portion (RCP) may be remotely mounted separately from the EPCU.

2.2.2 The EPCU also contains:

- Brake Cylinder Control Portion (BCCP) - The brake cylinder control portion provides brake cylinder pressure based upon the level of pipe 16 and pipe 20 pressures. Various BCCP portions are available depending upon the required brake ratio of the applied locomotive. The example below lists typical BCCP applications and pressures for reference only (Table 1).

Brake Application	Relay Type				
	J1.6-16	J.8	J1	J.6	J16
Min Brake	10-16 psi	6-14 psi	10-16 psi	5-10 psi	5-10 psi
Full Service BC Pressure	58-64 psi	37-43 psi	58-64 psi	28-32 psi	28-32 psi
*Emergency BC Pressure	70-82 psi	47-53 psi	70-82 psi	34-38 psi	34-38 psi
Full Independent BC Pressure	68-74 psi	35-39 psi	42-48 psi	25-28 psi	42-48 psi
20 Pipe Pressure	44-46 psi	44-46 psi	44-46 psi	44-46 psi	44-46 psi

*Pressures indicated above are for reference only.  
\* Emergency BC Pressure determined by ELV setting.*

**Table 1 BCCP Applications and Pressures (Reference only)**

- DB Triple Valve Portion (DBTV) - The DBTV develops brake cylinder pilot pressure during service brake applications, sensed by reduction of brake pipe pressure.
- Power Supply Junction Box (PSJB) - Contains the EPCU power supply.



- 13 Control Portion (13CP) - Provides Bail Off (Actuating) pipe pressure.
- Penalty Control Portion (PCP) - Used on Single Pipe Systems instead of a 13CP. Provides Split Penalty Functions.
- 16 Control Portion (16CP) - Provides brake cylinder limiting and brake cylinder assurance in emergency.

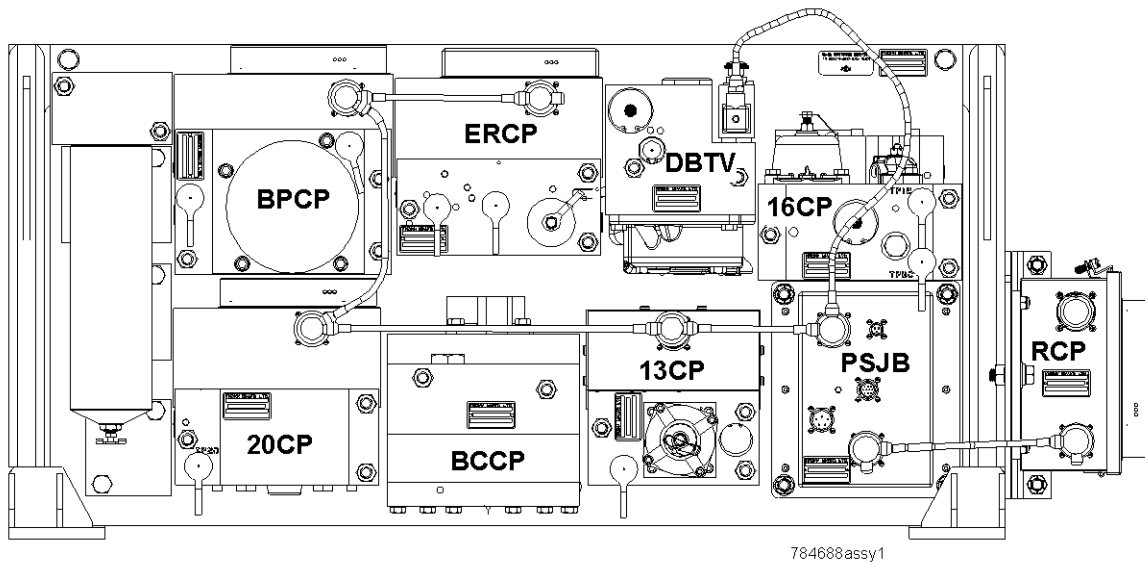


Figure 1 EPCU





### 3 EPCU Hardware Selection

In order to function properly to provide expected stopping power, the brake system must be applied to achieve independent and automatic braking ratios within defined limits. These limits are generally defined by the publication "Engineering and Design of Railway Brake Systems" published by The Air Brake Association. The required braking ratios are determined based on factors such as shoe type (esp. coefficient of friction) and number of shoes/axles. Generally speaking, the following information will be required in order to define the necessary cylinder pressure levels, and select an EPCU hardware configuration:

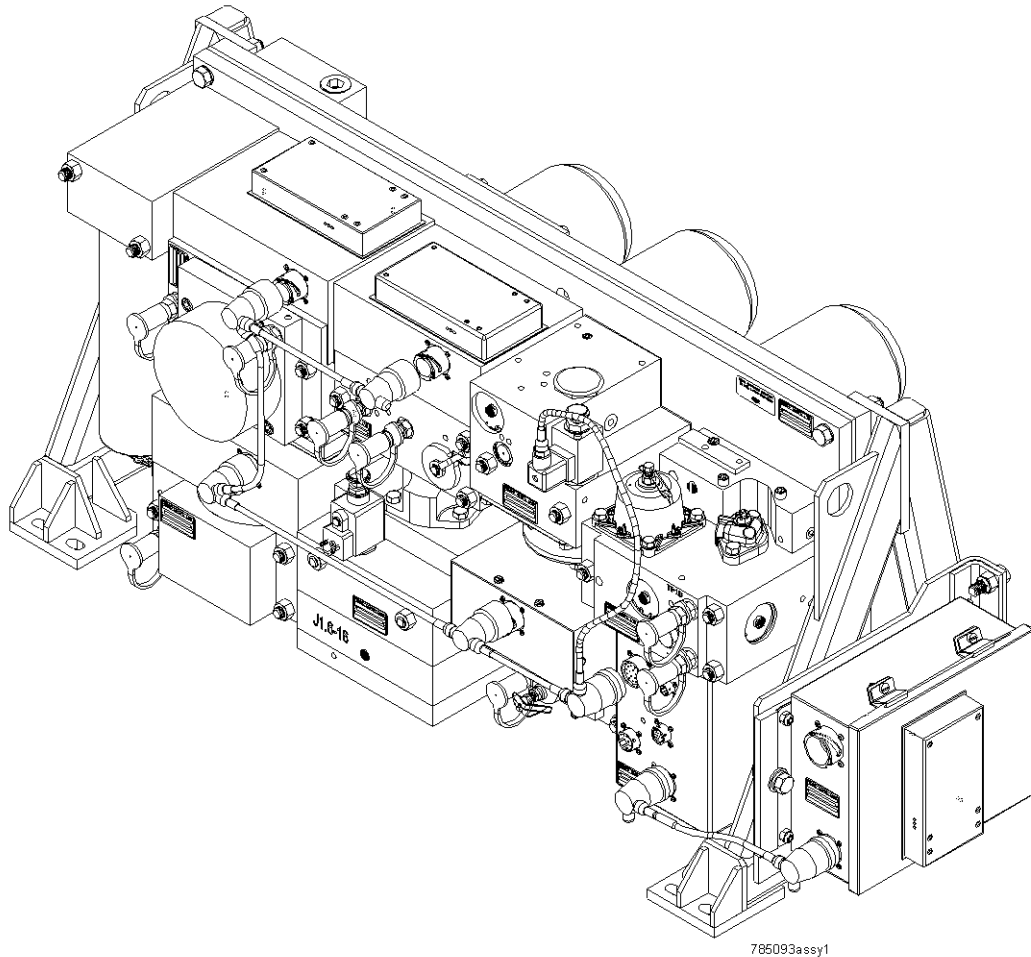
- 1) Locomotive Weight
- 2) Rigging Lever Ratio
- 3) Brake Cylinder Diameter
- 4) Number of Shoes
- 5) Shoe Type (cast iron, high friction composition, lower friction, etc.)

With these parameters known, a proper brake calculation can be performed per Referenced Document 1. The following targets are established in Reference 1 and other sources.

Shoe Type	Automatic Brake Ratio (Gross)	Independent Brake Ratio (Gross)
High Friction Composition	24 - 30% at 50 psi Control Pressure	38 - 50% at railroad's IA&R Full Pressure (typ. 45 psi)
Cast Iron	50 - 60% at 50 psi Control Pressure	50 - 60 % at 50 psi Control Pressure
Low Friction (yellow)	50 - 60% at 50 psi Control Pressure	50 - 60% at 50 psi Control Pressure
Extra Low Friction*	64 - 77% at 50 psi Control Pressure	64 - 77% at 50 psi Control Pressure

\*Extra Low Friction (ELF) shoes are intended to allow switch engines normally set to 35 psi Independent to be set to 45 psi Independent BC Pressure.

**Table 2 Example of Braking Ratios**



**Figure 2 CCB-26 EPCU**

The following pages may be used to help identify a CCB-26 EPCU based on general information. However, a brake calculation should always be performed to insure proper application, before a final selection is made.



### 3.1 Locomotives with Single Shoe Rigging and High Friction Composition Shoes

For locomotives which meet the following general criteria (Table 3):

Weight	270,000 - 290,000
Rigging Lever Ratio	2.8 - 3.2
Brake Cylinder Diameter	9"
Number of Shoes	8
Shoe Type	High Friction Composition

**Table 3 Locomotive General Criteria**

EPCUs with the following characteristics are typically applied (Table 4):

<b>BC Relay Type</b>	<b>J1.6-16</b>
Auto Brake Relay %	100%
Independent Brake Relay %	160%
Full Service BC Pressure	60 - 64 psi
Emergency BC Pressure	*75 - 79 psi
Full Independent BC Pressure	71 - 74 psi

\* 82 - 86 psi for EPCU P/N 783203

**Table 4 EPCU Characteristics**

All of the following EPCUs satisfy the criteria in Table 4 above. Choose from Table 5 below based on additional characteristics desired.

<b>EPCU Part Number</b>	<b>DBI Type</b>	<b>RCP Mounting</b>	<b>Dead Engine Regulator Setting</b>
785093	Type 1 or Type 2 selectable	on EPCU	25 psi
783203	none	on EPCU	31 psi
783601	none	on EPCU	31 psi
784688	Type 2	on EPCU	25 psi
785235	Type 1	on EPCU	31 psi
783015	none	*remote mount	31 psi

\*Requires Relay Control Portion (RCP) to be ordered separately. See Section 5.

**Table 5 Additional EPCU Characteristics**



### 3.2 Locomotives With Clasp Brake Rigging and High Friction Composition Shoes

For locomotives which meet the following general criteria (Table 6):

Weight	230,000 - 260,000*
Rigging Lever Ratio	2.7 - 2.9
Brake Cylinder Diameter	9"
Number of Shoes	16
Shoe Type	High Friction Composition

\* Locomotives may have less than 30% Gross Independent Brake Ratio. Check static holding capability.

**Table 6 Locomotive General Criteria**

EPCUs with the following characteristics are typically applied (Table 7):

BC Relay Type	J.6	or	BC Relay Type	J16
Auto Brake Relay %	60%		Auto Brake Relay %	60%
Independent Brake Relay %	60%		Independent Brake Relay %	100%
Full Service BC Pressure	28 - 32 psi		Full Service BC Pressure	28 - 32 psi
Emergency BC Pressure	34 - 38 psi		Emergency BC Pressure	34 - 38 psi
Full Independent BC Pressure	25 - 28 psi		Full Independent BC Pressure	44 - 46 psi

**Table 7 EPCU Characteristics**

All of the following EPCUs satisfy the criteria in Table 7 above. Choose from Table 8 below based on additional characteristics desired:

EPCU Part Number	DBI Type	RCP Mounting	Dead Engine Regulator Setting	BC Relay Type
784712	none	on EPCU	31 psi	J.6
786404	Type 1 or Type 2	on EPCU	20 psi	J16

**Table 8 EPCU Additional Characteristics**



### 3.3 Locomotives With Clasp Brake Rigging and Cast Iron or Low Friction Composition Shoes

For locomotives which meet the following general criteria (Table 9):

Weight	219,000 - 233,000
Rigging Lever Ratio	2.8
Brake Cylinder Diameter	9"
Number of Shoes	16
Shoe Type	Cast Iron or Low Friction Composition

**Table 9 Locomotive General Criteria**

EPCUs with the following characteristics are typically applied (Table 10):

<b>BC Relay Type</b>	<b>J-1</b>
Auto Brake Relay %	100%
Independent Brake Relay %	100%
Full Service BC Pressure	60 - 64 psi
Emergency BC Pressure	75 - 79 psi
Full Independent BC Pressure	44 - 46 psi

**Table 10 EPCU Characteristics**

All of the following EPCUs satisfy the criteria listed in Table 10 above. Choose from Table 11 below based on additional characteristics desired:

<b>EPCU Part Number</b>	<b>DBI Type</b>	<b>RCP Mounting</b>	<b>Dead Engine Regulator Setting</b>
784926	Type 2	on EPCU	25 psi
784876	none	on EPCU	31 psi
785633	Type 1 or Type 2	on EPCU	25 psi

**Table 11 EPCU Additional Characteristics**



### 3.4 Locomotives/Switch Engines with Clasp Brake Rigging and Extra Low Friction Shoes ("AAR Truck")

For locomotives which meet the following general criteria (Table 12):

Weight	180,000 - 253,000
Rigging Lever Ratio	2.65
Brake Cylinder Diameter	11"
Number of Shoes	16
Shoe Type	Extra Low Friction Composition

**Table 12 Locomotive General Criteria**

EPCUs with the following characteristics are typically applied (Table 13):

<b>BC Relay Type</b>	<b>J.8</b>
Auto Brake Relay %	80%
Independent Brake Relay %	80%
Full Service BC Pressure	38 - 42 psi
Emergency BC Pressure	48 - 52 psi
Full Independent BC Pressure	36 - 38 psi

**Table 13 EPCU Characteristics**

All of the following EPCUs satisfy the criteria listed in Table 13 above. Choose from Table 14 below based on additional characteristics desired:

<b>EPCU Part Number</b>	<b>DBI Type</b>	<b>RCP Mounting</b>	<b>Dead Engine Regulator Setting</b>
782330	none	*remote mount	31 psi
786383	none	on EPCU	20 psi
786403	Type 1 or Type 2	on EPCU	25 psi
*Requires Relay Control Portion (RCP) to be ordered separately. See Section 5.			

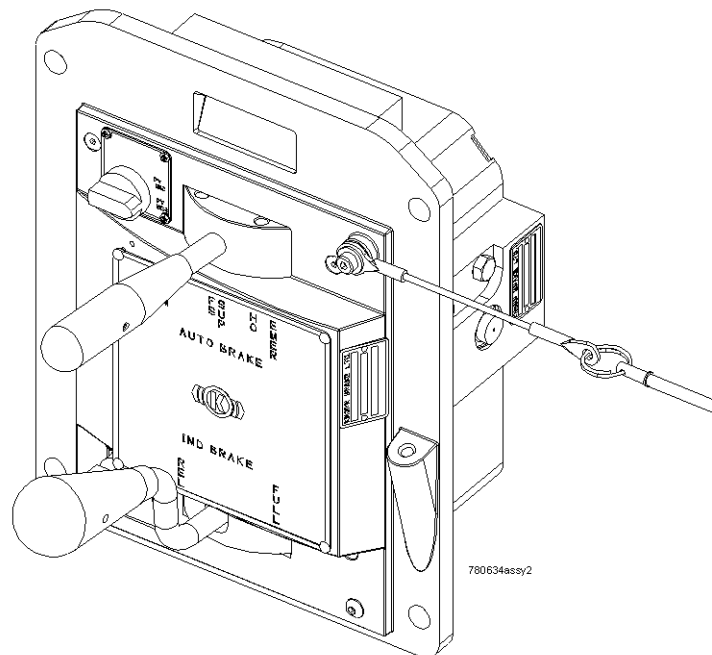
**Table 14 EPCU Additional Characteristics**

## 4 Electronic Brake Valve Selection

Electronic Brake Valves (EBV) for the CCB-26 brake system are designed to be used in either an AAR-type control stand or on a driver's destop. All EBVs contain control handles for both automatic and independent brake.

### 4.1 EBVs for AAR-Type Control Stand

EBVs for the AAR-type control stand are designed to bolt directly into a pre-existing opening for a 26C brake valve.



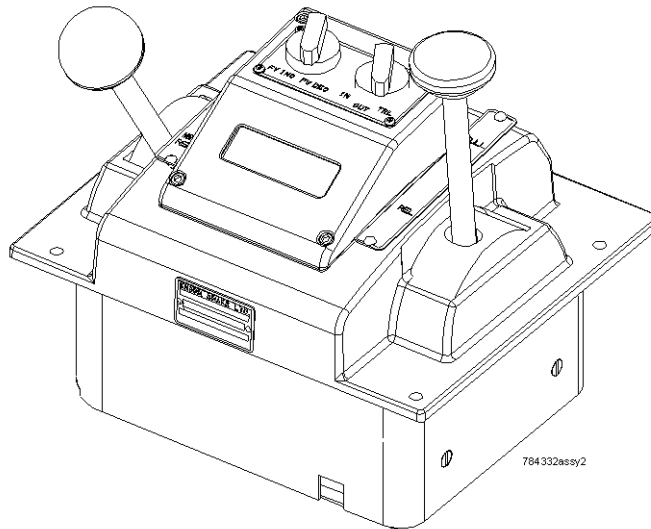
**Figure 3 CCB-26 EBV for AAR Control Stand**

EBV Part Number	Auto Handle	Indep Handle	Mode Switch	ER Adjust Switch	Comments
780634	Yes	Yes	3-Position FRT Only	Yes	
782513	Yes	Yes	3-Position FRT Only	Yes	Portugese Legend Plate

**Table 15 EBVs for AAR-Type Control Stand**



## 4.2 EBVs for Desktop Consoles



**Figure 4 CCB-26 EBV for Desktop Console**

EBV Part Number	Auto Handle	Indep Handle	Mode Switch	ER Adjust Switch	Comments
784332	Yes	Yes	3-Position FRT Only	Yes	

**Table 16 EBVs for Desktop Consoles**

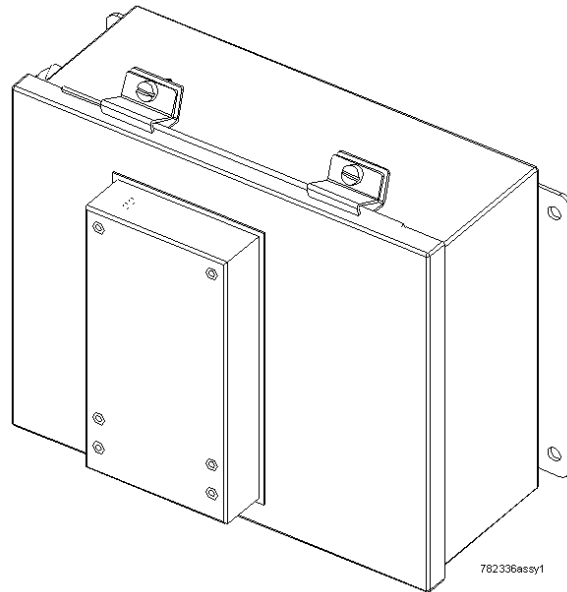




## 5 Relay Control Portion Selection

The Relay Control Portion (RCP) contains the electromechanical relays which provide the electrical interface between the CCB-26 brake system and the locomotive. This generally replaces the function of multiple pressure switches used in older pneumatic brake systems.

The RCP frequently comes pre-mounted to the side of the EPCU (see Section 3). However, if the RCP is not mounted as part of the EPCU, it must be ordered separately and installed as a stand-alone device. A cable will also be needed to connect the RCP to the EPCU.



**Figure 5 Relay Control Portion**

RCP Part Number	Relay K1 Contact	Relay K2 Contact	Relay K3 Contact	Relay K4 Contact	Relay K5 Contact	Sanding Relay Contact	Spare Relay Contact
782336	N.O.	N.O.	N/A	N.O.	N/A	N.O.	N/A
783387	N.O.	N.O.	N.C.	N.O.	N.O.	N.O.	N/A

**Table 17 RCPs for Remote Mounting**

<b>NOTICE</b>	<b>*NOTE</b> RCPs which mount on the EPCU have different part numbers.
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## 6 CCB-26 System Software Selection

The CCB-26 brake system is an electronically controlled air brake system. The ERCP, BPCP, 20CP, RCP, and EBV are all processor controlled, and therefore require software. The function of the system can be changed based on the software selected. One software part number must be chosen for the complete CCB-26 system.

Function	Software Part Number			
	1749	1789	1813	1922
IA&R Pipe Maximum Pressure (Handle in Full)	46 psi	46 psi	52 psi	46 psi
Reduction of ER Pressure when Auto is in Full Service	26 psi	2/7 <sup>ths</sup> of ER Pressure at Rel, +2 psi	26 psi	26 psi
Graceful Cut-in Function	Always functions	Functions only when transmitting from Trail to Lead Cut-in	Always Functions	Always Functions
PCS delay when a trainline emergency occurs	None	20 sec.	None	None
PCS activated when brake pipe pressure is <25 psi	No	Yes	Yes	No
RCP K1 Relay Output	Power Cut-off Switch (PCS)	PCS	PCS	PCS
RCP K2 Relay Output	Power Cut-off Switch (PCS) Redundant	PCS redundant	PCS redundant	PCS redundant
RCP K3 Relay Output	N/A	N/A	Independent Brake Switch (IBS)	Trail Mode
RCP K4 Relay Output	Engineer Induced Emergency (EIE)	EIE	EIE	EIE
RCP K5 Relay Output	Main Reservoir Pressure Switch for remote control interface (MRPS)	MRPS	N/A	Temp/Perm Suppression
Spare Relay Output	Independent Brake Switch (IBS)	IBS	N/A	N/A

**Table 18 CCB-26 System Software**

## 7 Cable Selection

### 7.1 Selecting an EPCU to EBV Cable

An interconnect cable is required to connect the EPCU to the EBV. Choices are outlined in Table 19 below. Contact NYAB if a non-standard cable length is required.

<b>Cable Part Number</b>	<b>Length (nominal)</b>
775277	16.3 ft.
784354 - 0128	12.8 ft.
784354 - 0190	19.0 ft.
784354 - 0293	29.3 ft.
784354 - 0460	46.0 ft.
784354 - 0600	60.0 ft.
784354 - 0753	75.3 ft.
784354 - 0800	80.0 ft.
784354 - 0992	99.2 ft.

**Table 19 EPCU to EBV Cable Selection**

### 7.2 Selecting an EPCU to RCP Cable

If an EPCU with side-mounted RCP is selected, the interconnect cable is included in the assembly. However, if a remote mounted RCP is used, a separate cable must be selected. See Table 20 below. Contact NYAB if a non-standard cable length is required.

<b>Cable Part Number</b>	<b>Length (nominal)</b>
782335	13.1 ft.
783402 - 0067	6.7 ft.

**Table 20 EPCU to RCP Cable Selection**

## 8 Ordering EPCU and EBV With Software

After EPCU and EBV hardware and system software have been identified, the pre-programmed system can be ordered by part number. The programmed units are identified by the hardware part number, followed by a dash, and then the software part number. See examples below in Table 21.

Examples:

Device	Hardware Part Number	Software Part Number	Orderable Programmed Assembly
EBV	780634	1749	780634 - 1749
EPCU	782513	1789	782513 - 1789
EPCU	784712	1749	784712 - 1749
EPCU	784926	1789	784926 - 1789
EPCU	785884	1922	785884 - 1922

**Table 21 Ordering EPCU and EBV With Software**

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**Still have questions?**

**Contact a NYAB representative using the contact information supplied on page 2.**

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